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THE EFFECT OF BEDREST ON VARIOUS PARAMETERS OF PHYSIOLOGICAL FUNCTION

PART VIII. THE EFFECT ON THE CARDIOVASCULAR TOLERANCE TO PASSIVE TILT

by C. Vallbona, D. Cardus, F. B. Vogt, and W. A. Spencer

Prepared under Contract No. NAS 9-1461 *by*
TEXAS INSTITUTE FOR REHABILITATION AND RESEARCH
Houston, Texas
for

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ABSTRACT

This study was carried out to evaluate the effect of short term (3 days) and long term (14 days) bedrest on the cardiac tolerance to passive tilt. It showed that there was a deterioration of the subjects' ability to tolerate passive tilt. The deterioration was demonstrated by the negative slopes of the regressional line of blood pressure vs. time and the positive slopes of heart rate vs. time observed during tilt procedures at the end of the period of bedrest. The intolerance to tilt was more evident after bedrest for 14 days. This study showed also that isometric exercises performed while on bedrest improved the subjects' tolerance to passive tilt, as evidenced in the slopes of blood pressure, which although negative were less steep.

FOREWORD

This study is a part of a NASA investigation of the effect of bedrest on various parameters of physiological function. It was sponsored by NASA Manned Spacecraft Center under Contract NAS-9-1461, with Dr. Lawrence F. Dietlein, Chief, Space Medicine Branch, serving as Technical Monitor.

This study was conducted in the Immobilization Study Unit of the Texas Institute for Rehabilitation and Research, The Texas Medical Center. The authors are affiliated with Baylor University College of Medicine as follows: Dr. Vallbona, Departments of Rehabilitation, Physiology, and Pediatrics; Dr. Cardus, Departments of Rehabilitation and Physiology; Dr. Vogt, Department of Rehabilitation; and Dr. Spencer, Department of Rehabilitation.

The authors are greatly indebted to Dr. H. E. Hoff for his participation in the planning and realization of this study and for his review of this report. Acknowledgement and appreciation are extended also for the contributions of Dr. T. Watt, Mrs. D. Bellis, Mrs. A. Goldstein, and Mr. T. O. Townsend for their assistance during the experiments; to Mr. R. Lamonte and his assistants of the Bioinstrumentation Section, Space Medicine Branch, MSC-NASA, for their efforts in providing bioinstrumentation support; to Mr. R. Hooker and Miss M. E. Oro for their part in the digitizing of records; to Miss M. Lewis and Mr. Floyd Rosenbaum for the computer programming of the initial calculations and plotting of the digitized data; to Messrs. W. Blose, T. McBride, and H. Thompson for the statistical analyses; to Dr. M. T. deCaralt for the preparation of the graphs; and to Miss S. Beggs and Mrs. L. Shropshire for the editing and preparation of the manuscript.

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SUMMARY

This study was carried out to evaluate the effect of short term (3 days) and long term (14 days) bedrest on the cardiac tolerance to passive tilt.

The study showed that there was a deterioration of the subjects' ability to tolerate passive tilt. The deterioration was demonstrated by the negative slopes of the regressional line of blood pressure vs. time and the positive slopes of heart rate vs. time observed during tilt procedures at the end of the period of bedrest. The intolerance to tilt was more evident after bedrest for 14 days. This study showed also that isometric exercises performed during bedrest improved the subjects' tolerance to passive tilt (as evidenced in the slopes of blood pressure) which, although negative, were less steep.

INTRODUCTION

Numerous investigators have reported a decreased tolerance to passive tilt (feet down) as one of the manifestations of "cardiovascular deconditioning" resulting from prolonged bedrest or water immersion.[1,2,3,4,5,6] The intolerance to tilt may result from a decreased venomotor tone in assuming the erect position, from pooling of blood in the dependent areas, from shift of fluids from the intravascular to the extracellular space, or from a combination of these and other factors. The end result is a decrease in venous return or a reduction of the effective circulatory blood volume.

Several procedures have been investigated for their value in minimizing the effect of bedrest on the adaptation response of the cardiovascular system to gravity changes. In the studies of Whedon, et al.,[7] periodic rocking of the body by an oscillating bed seemed to afford partial maintenance of the cardiovascular competence. Graveline,[5] in studying the

"cardiovascular deconditioning" of water immersion, has reported beneficial effects of the intermittent inflation above venous pressure of tourniquet cuffs on the extremities. In a feasibility study conducted in five healthy subjects at the Texas Institute for Rehabilitation and Research, the performance of repeated Valsalva maneuvers during bedrest did not prevent tachycardia in response to passive tilt. A similar degree of tachycardia had been observed previously in these subjects after three days of bedrest without performance of Valsalva maneuvers.

In the published studies of the effect of bedrest on the cardiovascular tolerance to passive tilt, there are data pertaining to changes in arterial blood pressure and in heart rate. Equally important, however, is that there may be an abnormal response of the time relationships between the different phases of the cardiac cycle (duration of systole and duration of diastole). Since it is known that even in healthy subjects there are important changes in the duration of systole and diastole upon assumption of the erect posture,[8,9,10] it seemed worthwhile to investigate the extent to which bedrest may produce an abnormal response of these aspects of cardiac dynamics.

This report presents data which illustrate some effects of short-term (3 days) and prolonged (14 days) bedrest on the cardiovascular tolerance to passive tilt. Included are measurements of rates of change of blood pressure (systolic, diastolic, mean, and differential) and heart rate, measurements of the changes in the duration of the cardiac cycle (and its phases), and measurements of the pulse wave velocity.

METHOD

A. Subjects

Thirteen healthy volunteers participated in the experiments that were designed to test the effects of bedrest of the cardiovascular tolerance to passive tilt.

Six subjects participated in the first study which included a first period of three days of bedrest and a second period of three days of bedrest during which the subjects performed isometric exercises in the horizontal position.

The second study was conducted with a new group of six subjects who remained in bed for a first period of 14 days. Five of them also participated in a second period of 14 days of bedrest with isometric exercise. One additional subject was included in the second period as a replacement of one subject who requested dismissal after the first period of 14 days of bedrest alone.

The physical characteristics of the subjects who participated in both studies are presented in Table 1.

B. Experimental conditions

The six subjects who participated in the first study (Study I) were admitted to the Immobilization Research Center of the Texas Institute for Rehabilitation and Research on April 30, 1963 and were kept under observation for a period of five days. The subjects slept and had their meals in the hospital. They were on a diet of 100 grams of protein, 1000 milligrams of calcium, and 2300 calories. Intake and output were carefully recorded. The subjects drank as much distilled water as they wished. After these days of observation, they remained in bed for three days. They were allowed to move freely in the horizontal position but were under constant surveillance to prevent the raising of their legs or trunk above the horizontal position. They were allowed one pillow under the head. Meals and emunctory functions were performed in the horizontal position. Following this first period of bedrest the subjects were kept under observation for an additional three days; they were on the same diet and the same conditions existed as before bedrest. The subjects were dismissed on May 11, 1963. They were readmitted on May 15, 1963 and were kept under observation for five days; they were on the same diet and the same conditions existed as before the first period of bedrest. The second period of bedrest lasted three days also. It had the same characteristics as the first period with the exception of a program of isometric exercises that were carried out in the horizontal position four times a day at two hour intervals. Following bedrest, the subjects were in the hospital for an additional two days of observation.

The experimental conditions of the second study (Study II) were similar to those of the first with the following exceptions. The subjects remained under observation for seven days before bedrest and for four days after bedrest. The duration of bedrest was 14 days. The program of isometric exercises in the second period of Study II was carried out six times a day. Bedside monitoring during bedrest was less intensive in the second study. Hematologic and serum biochemical measurements were made less frequently.

C. Cardiovascular testing

In order to evaluate the effect of bedrest on the competence of the cardiovascular system, a psssive tilt test was done immediately before and after each period of recumbency. All subjects were tilted to 70° with a motorized tilt table capable of changing from 0° to 70° in 35 seconds. A specially constructed saddle permitted supporting the subjects on the ischial tuberosities while the feet remained down and unsupported.

TABLE 1

SUBJECTS PARTICIPATING IN STUDY I
TWO PERIODS OF THREE DAYS OF BEDREST

TIRR Subject No.	Name	Age (years)	Height (centimeters)	Weight (kilograms)	Body Surface Area (m^2)	Usual Occupation
70-0-01	RKW	27	183.0	81.8	2.04	Newswriter
70-0-06	CBB	39	177.8	75.0	1.92	Oil refinery process operator (on strike)
70-0-07	RNM	21	177.8	72.7	1.90	Clerk
70-0-08	WRS	21	190.5	75.0	2.02	Student
70-0-09	THL	37	180.4	78.1	1.98	Oil refinery process operator (on strike)
70-0-10	RGW	40	175.2	76.8	1.92	Oil refinery process operator (on strike)

SUBJECTS PARTICIPATING IN STUDY II
TWO PERIODS OF FOURTEEN DAYS OF BEDREST

70-0-11	ACL	33	170.3	62.7	1.73	Student athlete
70-0-12	TGO*	21	188.0	79.2	2.06	Student
70-0-13	MGO	24	177.8	79.2	1.97	Student athlete
70-0-14	DC	24	180.4	75.0	1.94	Student
70-0-16	CLB**	24	185.5	85.7	2.10	Student counselor
70-0-17	CP	34	180.4	77.0	1.97	School teacher
70-0-18	ACI***	22	165.0	50.0	1.54	Student athlete

* Participated in first period only (fourteen days of bedrest)
** Had to be dismissed on the thirteenth day of bedrest of the second period
*** Participated in second period only (fourteen days of bedrest with isometric exercise)

The tilt procedure in the two periods of the first study consisted of several minutes of lying flat to attain data representative of an equilibrium condition, followed by passive tilt to 70°. The subjects then stayed in the 70° tilt position for four minutes, after which they were tilted down to 0° and then stayed supine for four minutes. A second tilt procedure was done, during which the subjects remained at 70° tilt for 10 minutes before tilt down to the supine position for a period of six minutes. In this second tilt procedure, a Valsalva maneuver (Flack test) was done immediately after reaching 70° and again three minutes after returning to 0°. In general the Valsalva maneuver was performed for 15 seconds, but in some subjects and on some days, the procedure lasted up to 22 seconds. The schedule for the tilt procedures was not strictly adhered to in all subjects. The duration of the tilt tests after the first period of bedrest was different than before bedrest. The first tilt lasted for 10 minutes and the second tilt (with a provocative Valsalva maneuver) lasted for four minutes only. The duration of tilts was shortened on subject W. S. (TIRR #70008) because he developed orthostatic hypotension in some tilt experiments.

The tilt procedure carried out in the experiments of the second study (14 days of bedrest) consisted of several minutes of lying flat until a steady state was reached. Passive tilt to 70° was carried out on the same tilt table. The subjects stayed at 70° for 15 minutes unless signs of impending syncope developed. They were then tilted down to 0° for a period of six minutes. A provocative Valsalva maneuver was done at the end of the third minute after returning to 0°. The duration of the Valsalva was precisely timed at 15 seconds in all the subjects on all the days.

D. Method of recording

During the entire procedure of tilt and Valsalva maneuvers the following cardiovascular and respiratory variables were continuously monitored: electrocardiogram, phonocardiogram, carotid and radial pressure pulses, arterial blood pressure (by cuff - microphone apparatus), direct intra-arterial blood pressure, cardiotachogram, impedance pneumogram, and airway pressure.

The electrocardiogram was recorded by means of two silver mesh electrodes placed on the thorax at the mid-axillary line at the level of the fifth or sixth intercostal space. The same electrodes were used to record the impedance changes across the chest during respiration to provide an analogue recording of the ventilatory movements. The heart sounds were detected by a stethoscopic microphone that was taped over the precordium. The carotid pulse was sensed with a peizoelectric crystal placed on the surface of the neck where the pulsations of the carotid artery were palpated best. A radial pulse was detected with a similar crystal placed on the left wrist where pulsations were visualized or palpated.

The arterial blood pressure in the left arm was obtained with an indirect cuff - microphone method. The pressure inside the cuff was automatically inflated and deflated every 30 seconds with a pneumatic pump, and the cuff pressure was detected and recorded

during deflation of the cuff; the Korotkoff sounds were superimposed on the decay curve of the cuff pressure. The intra-arterial blood pressure was recorded with a 20 gauge needle inserted in the right brachial artery at the point of the elbow flexure. The needle was connected to a Statham pressure transducer by means of flexible cardiac catheter filled with a heparinized solution of normal saline. The gauge was placed laterally to the arm and at the same level with the sternal angle. The pressures registered with this system were considered equal to those at the aortic arch, but in the position of maximum tilt they did not reflect the pressure inside the brachial artery due to the weight of the column of blood between the gauge and the point of insertion of the needle. Since the distance from the gauge to the point of insertion of the needle was measured, it was possible to make a correction for the weight of the column of blood. The angle of tilt was taken into consideration in making this correction.

The airway pressure was measured by means of a transducer connected to the Flack tester which the subject used to attain an airway pressure of 40 mm. Hg. during the expiratory effort. The instantaneous heart rate was recorded by means of a cardiotachometer triggered by each QRS complex of the electrocardiogram. The output of this cardiotachometer has an amplitude that correlates almost linearly with the duration of the R-R interval of the electrocardiogram.

E. Measurements

Graphic analogue records were obtained by playing back the magnetic analogue tape onto a "Physiograph Six" direct recorder with rectilinear pens (first study) and on an Offner Dynograph recorder (second study). Records run at a paper speed of 0.2 centimeters per second were converted to digital form with a Benson-Lehner OSCAR Model E semi-automatic analogue-to-digital converter. The measurements of blood pressure taken every 30 seconds were digitized. The values of systolic and diastolic blood pressure registered with the direct technique were digitized at each recording of the first and last Korotkoff sounds during deflation of the cuff. The duration of the cardiac cycle was digitized from the cardiotachogram corresponding to each of the readings of the direct and indirect blood pressure measurements.

The electrocardiogram, phonocardiogram, and carotid and radial pulses were played back by means of a CEC optical galvanometer recorder at a speed of 13.7 centimeters per second (first study) and on an Offner Dynograph recorder at a speed of 12.5 centimeters per second (second study). The frequency responses of these instruments are very adequate for the type of measurements of this investigation.

Fast speed direct records of the data of the first study were produced for analysis at the following situations: steady state in the supine position (situation 01); immediately after reaching 70° (situation 02); steady state at 70° (situation 03); immediately after reaching 0° (situation 04); steady state at 0° (situation 05); immediately after reaching 70° on the second tilt (situation 06); at the end of the Flack test, at 70° (situation 07); steady state at 70° on the second tilt (situation 08); immediately after reaching 0° (situation 09); steady state at 0° (situation 10); immediately after Flack test, at 0°

(situation 11); and steady state at 0° (situation 12). Approximately 25 beats were recorded at each situation. (figure 1)

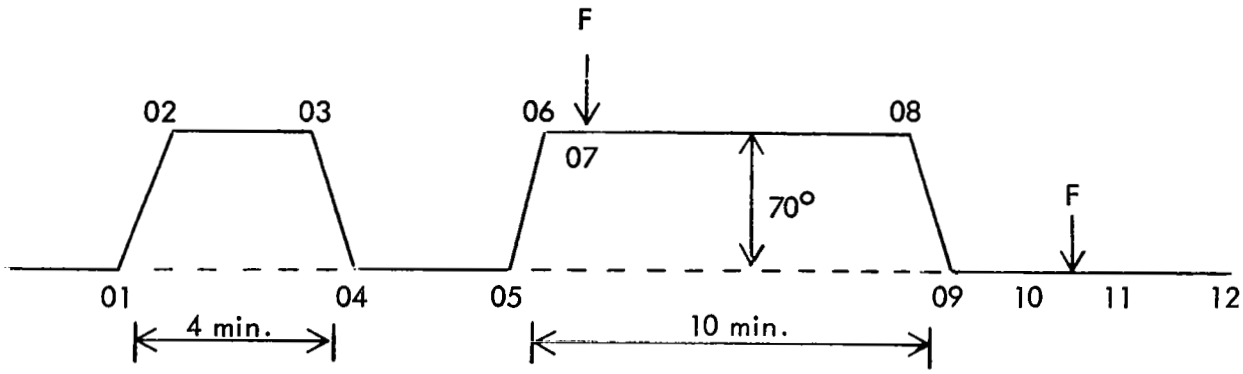


Figure 1. - Diagram of the sequence of the tilts and situations corresponding to the tests of the first study (3 days of bedrest).

The situations which were analyzed for the second study were the following: steady state at 0° (situation 01); immediately after reaching 70° (situation 02); steady state before the end of tilt (situation 03); immediately after return to 0° (situation 04); steady state at 0° (situation 05); during Valsalva maneuver (situation 06); and final steady state at 0° (situation 07). (figure 2)

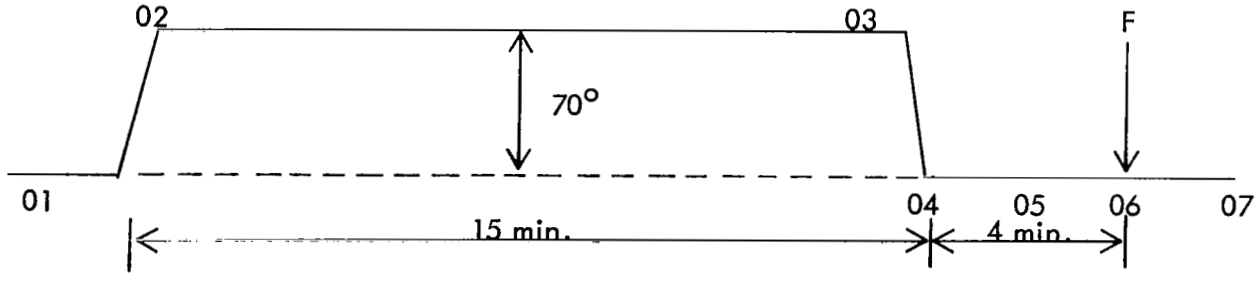


Figure 2. - Diagram of the sequence of the tilts and situations corresponding to the tests of the second study (14 days of bedrest).

F. Computation of data.

The magnetic tape analogue records of the cardiovascular measurements were played back and recorded on an ink recorder at fast paper speed for conversion to digital form with a semi-automatic analogue to digital converter (Telecordex). Readings were taken to correspond to the point of the initiation of the QRS complex, to the onset of the

carotid pulse, to the onset of the radial pulse, to the onset of the second heart sound, and to the onset of the dicrotic notch. The time intervals between these events permitted calculation of the duration of the electromechanical systole (from the onset of QRS to the onset of the second sound), the duration of the isotonic phase of the systole (from the onset of the carotid pulse to the dicrotic notch), and the duration of the isometric phase (total duration of systole minus the duration of the isotonic phase). The pulse wave velocity was computed by measuring the time lag between the onset of the carotid and radial pulses and by measuring the distance between the sternal angle and the points where the carotid and radial pulses were detected. The technique was the same as carried out in this laboratory by Woolam, Schnur, Vallbona, and Hoff.[11] The basic technique for making measurements from simultaneous registration of the electrocardiogram, phonocardiogram, and carotid pulse is identical to that of Blumberger.[9] The measurements correspond to what Raab calls the chronodynogram.[10] The duration of the interval from the onset of QRS to the onset of the second sound includes an excitation period which normally is about 40 milliseconds. In spite of this, the interval from Q to the second sound is a better estimate of the duration of systole than the QT time or the interval between the onset of the first and second sounds.[9] In these measurements of the duration of systole, a correction was not made for the short interval of isometric relaxation (protodiastole) that precedes the closure of the semilunar valves.

In order to obtain greater information from the measurements of cardiac dynamics it was necessary to take into consideration the effects attributable to changes in cardiac frequency. An increase in the heart rate causes a marked shortening of diastole, a smaller shortening of the isotonic phase of systole and an even smaller shortening of the isometric phase. There is information available on the quantitative relationship between the increase in cardiac frequency and the shortening of systole (and its phases).[9, 12, 13] Using the formulas proposed by Hegglin[14] and by Blumberger[9], it was possible to calculate to what extent the changes in the duration of systole and its phases were greater or smaller than predicted for the specific cardiac frequency measured at each situation of the tilt procedure. The results were expressed in terms of systolic and isotonic ratios.

The digitized data pertaining to arterial blood pressure and to the duration of the cardiac cycle permitted computations of the heart rate, the mean blood pressure, and the differential blood pressure during supine and tilt positions. The computed data were presented in digital plots and the results averaged for each group of six subjects and for each period of study. By using these values, it was possible to calculate the slopes of the direct intra-arterial blood pressure and heart rate for each subject during each tilt test. The average slopes were computed for the group of subjects who were studied on the same day under similar circumstances.

RESULTS

A. Changes in heart rate and blood pressure

Figure 3 presents the graphic plots of the average values of heart rate, systolic blood pressure, diastolic blood pressure, mean blood pressure, and pulse pressure for the

group of six subjects who participated in the first period of the second study (14 days of bedrest). The plots represent the average values at various intervals during the time they were supine before tilt, during the passive tilt, and after return to the horizontal position. The results corresponding to the second period of the second study (14 days of bedrest with isometric exercise) are presented in figure 4. The values of arterial blood pressure are indicated in the ordinates labeled ABP. Those of pulse pressure are labeled DY. The onset of the tilt is indicated by T_1. The return to 0^o after tilt is indicated by D_1. On these two figures, the values of ABP in the positions of tilt have not been corrected for the weight of the column of blood between the insertion of the needle in the brachial artery and the blood pressure transducer. These plots are not representative of the dynamic behavior of the cardiovascular system during all phases of passive tilt in each group of six subjects because the average values in the latter part of the tilts exclude those subjects who developed orthostatic hypotension at different times of the test. A review of the graphic plots of the values obtained in each subject revealed definite trends in changes of blood pressure and heart rate during the tilts. It was believed that a linear regression equation would reflect adequately these trends. For this reason, the slopes of the regression line of blood pressure vs. time and heart rate vs. time were calculated on each subject and the results averaged for the group of six subjects who were studied on the same day.

Figures 5 and 6 present the average slopes of systolic blood pressure, diastolic blood pressure, mean pressure, and pulse pressure during the two separate tilts conducted in each one of the periods in the first study. The average and standard deviations of the values measured at zero degrees before and after tilts are presented in these figures also. The slopes of these figures pertain to a group of five subjects excluding subject W. S. (TIRR #70008) whose response was exaggerated in relation to that of the others. Since he exhibited orthostatic hypotension even before the first period of bedrest, it was felt that a better assessment of the effect of bedrest would be reflected in the group of five individuals only.

Although only five subjects participated in the two periods of the second study, the results were not statistically different when the sixth subject (a different one in the two periods) was included in the group. The average slopes for the group of six subjects of the second study are presented in figures 7 and 8.

It must be pointed out that there was a rather large coefficient of variation in each set of slopes pertaining to the subjects who were tested on the same day. This was more evident in the tests after bedrest, probably because of the different duration of the passive tilt tests in some subjects.

In spite of the degree of variability in the slopes, there was a difference in the averages obtained before and after bedrest. In some cases this was statistically significant at $p < 0.05$ level. In contrast, the slopes after bedrest with isometric exercise

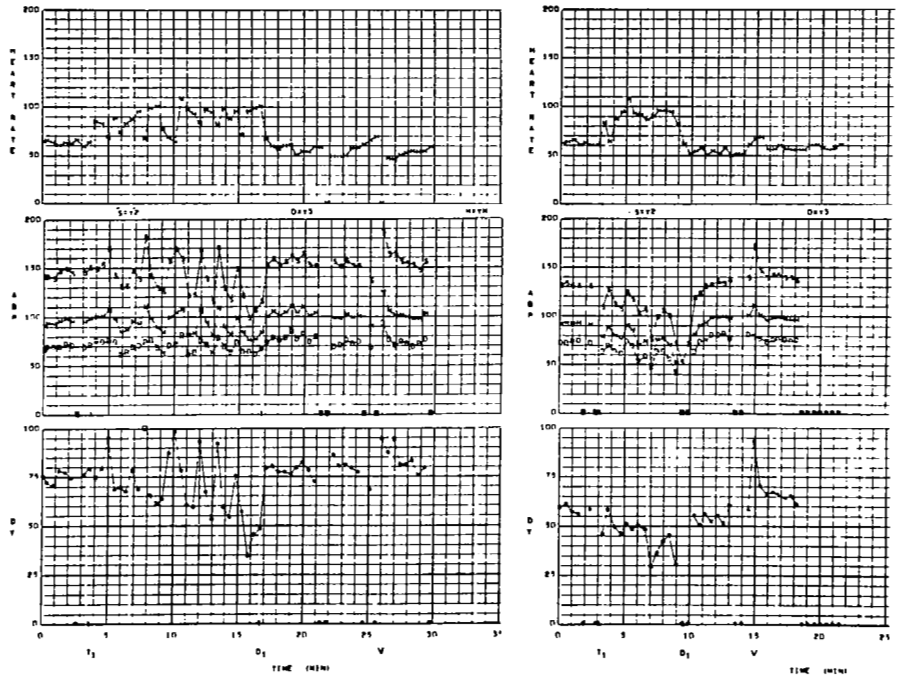


Figure 3. Changes in circulatory dynamics during passive tilt following fourteen day bedrest.

APB = arterial blood pressure; DY = pulse pressure; T_1 = onset of tilt to 70^{o}; D_1 = return to 0^{o}; V = Valsalva maneuver

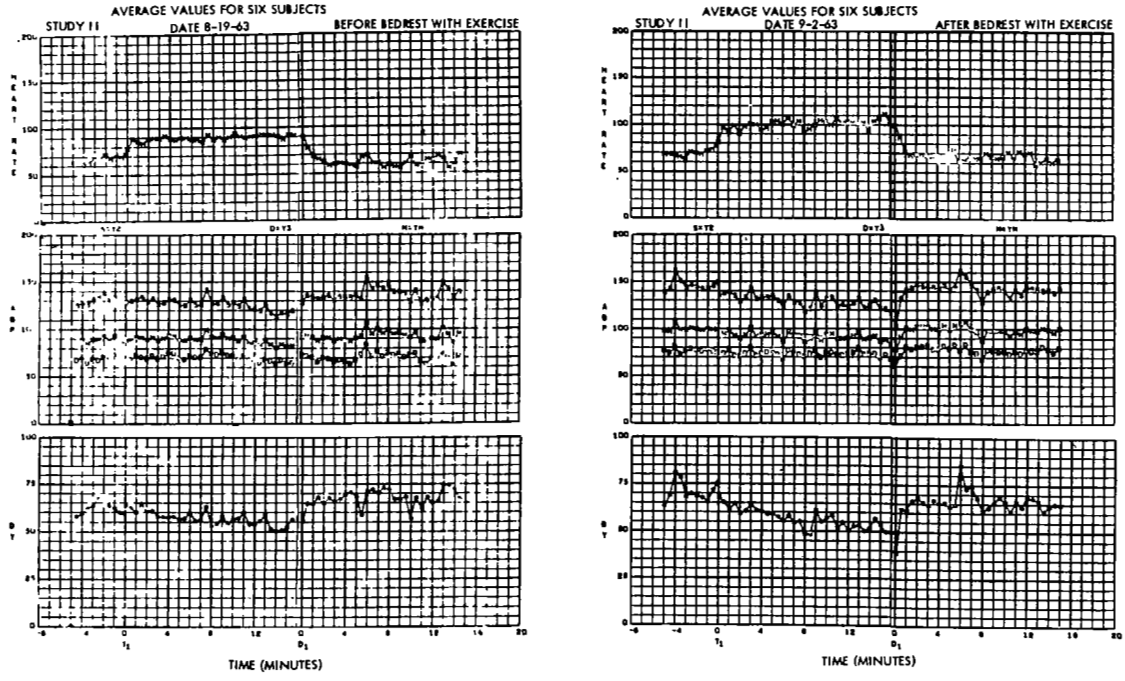


Figure 4. Average values of the heart rate and arterial blood pressure during the tilts before and after 14 days of bedrest with exercise. The same symbols were used for these plots as in figure 3.

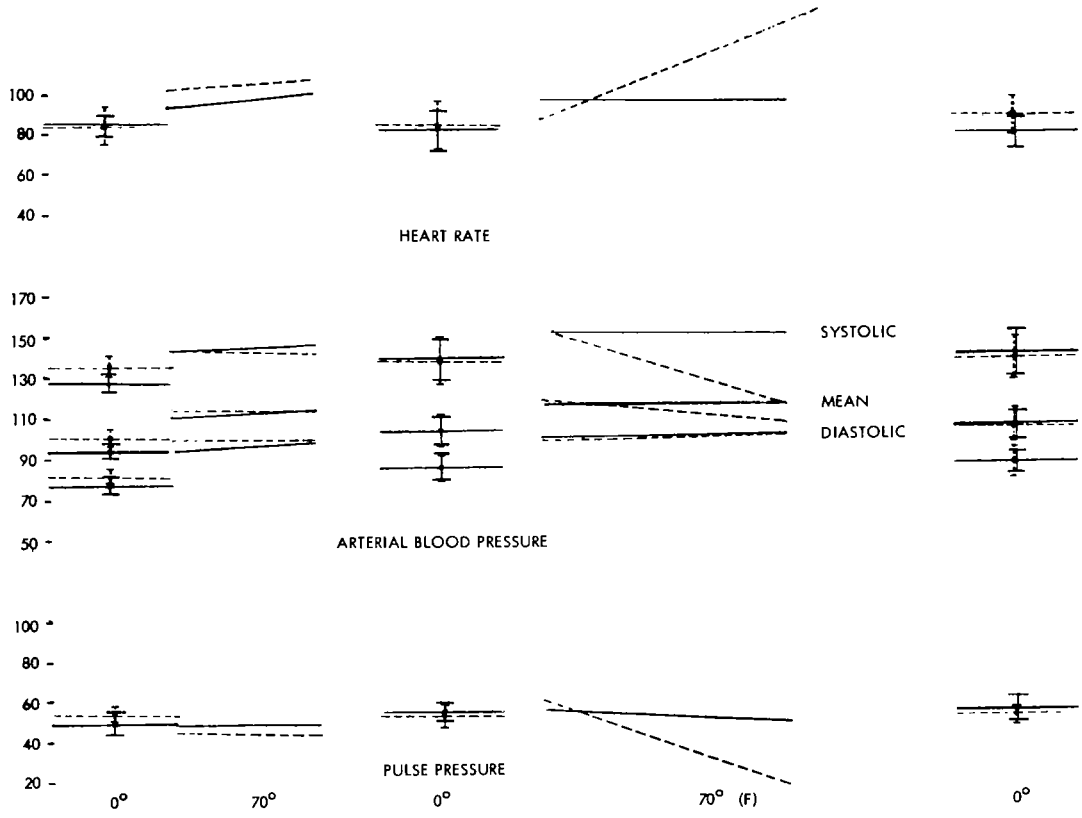


Figure 5

Slopes of the heart rate and arterial blood pressure during passive tilt before and after 3 days of bedrest. The solid lines indicate values before bedrest. The dotted lines indicate values after bedrest. A provocative Flack test was done at the beginning of the tilt indicated as 70° (F). The values presented in this figure represent the averages of a group of 5 subjects. The values of subject W. S. were excluded because he developed orthostatic hypotension in the tilts before bedrest.

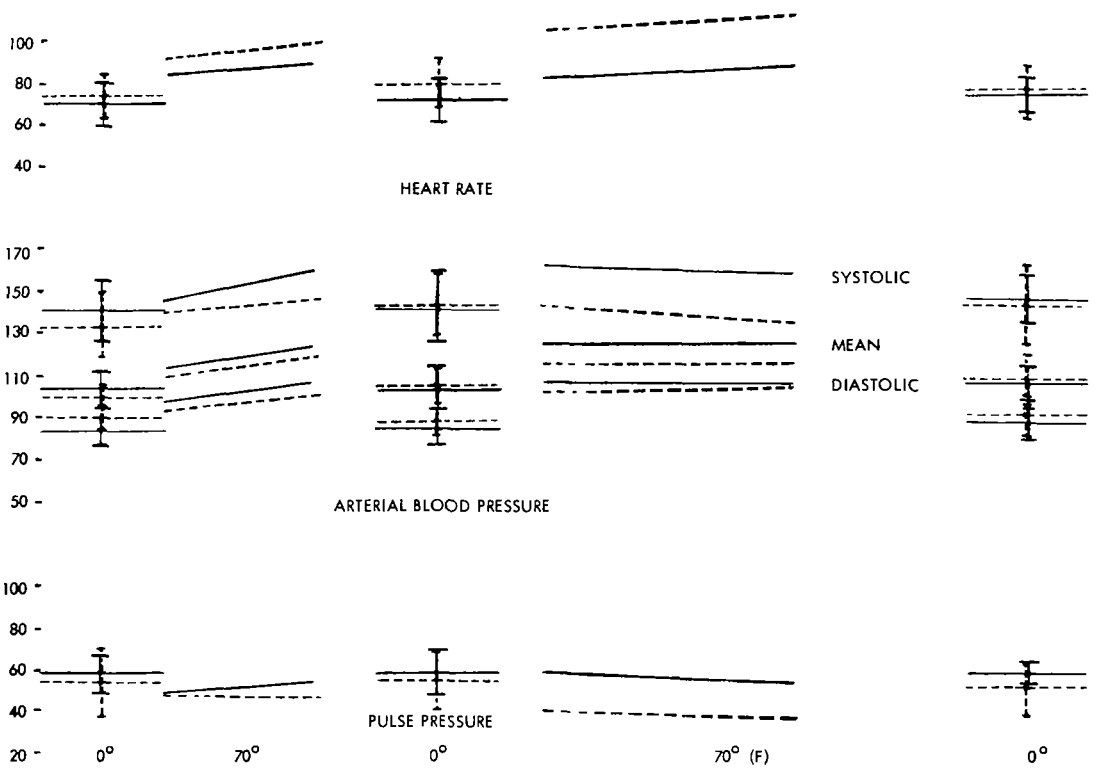


Figure 6

Slopes of the heart rate and arterial blood pressure during passive tilt before and after 3 days of bedrest with exercise. The solid lines indicate values before bedrest. The dotted lines indicate values after bedrest. A provocative Flack test was done at the beginning of the tilt indicated as 70° (F). The values presented in this figure represent the averages of a group of 5 subjects. The values of subject W. S. were excluded because he developed orthostatic hypotension in the tilts before bedrest.

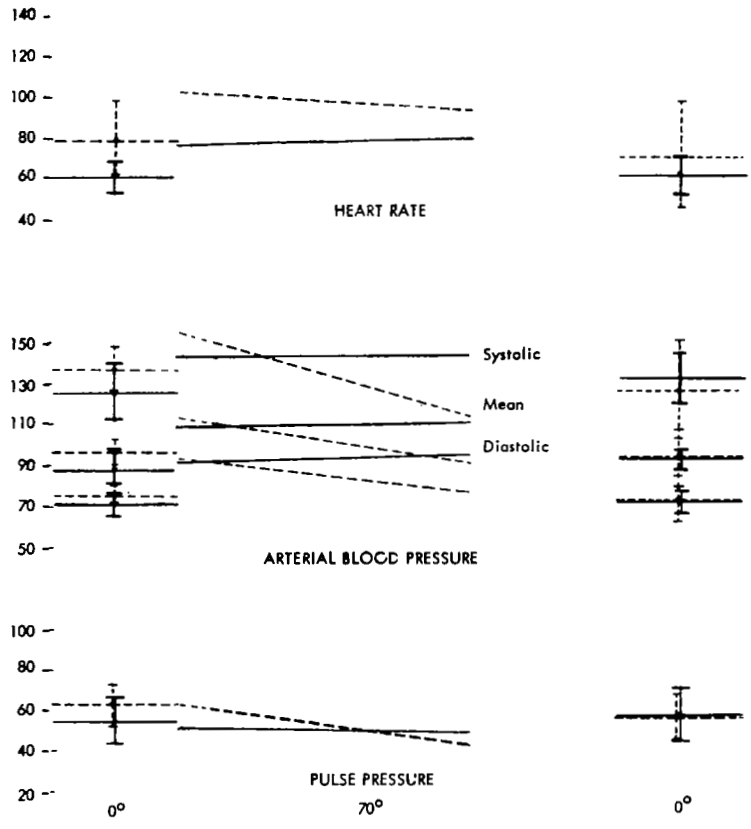


Figure 7

Slopes of the heart rate and arterial blood pressure during passive tilt before and after 14 days of bedrest. The solid line indicates values before bedrest. The dotted lines indicate values after bedrest. The values presented in this figure represent the averages of the group of 6 subjects.

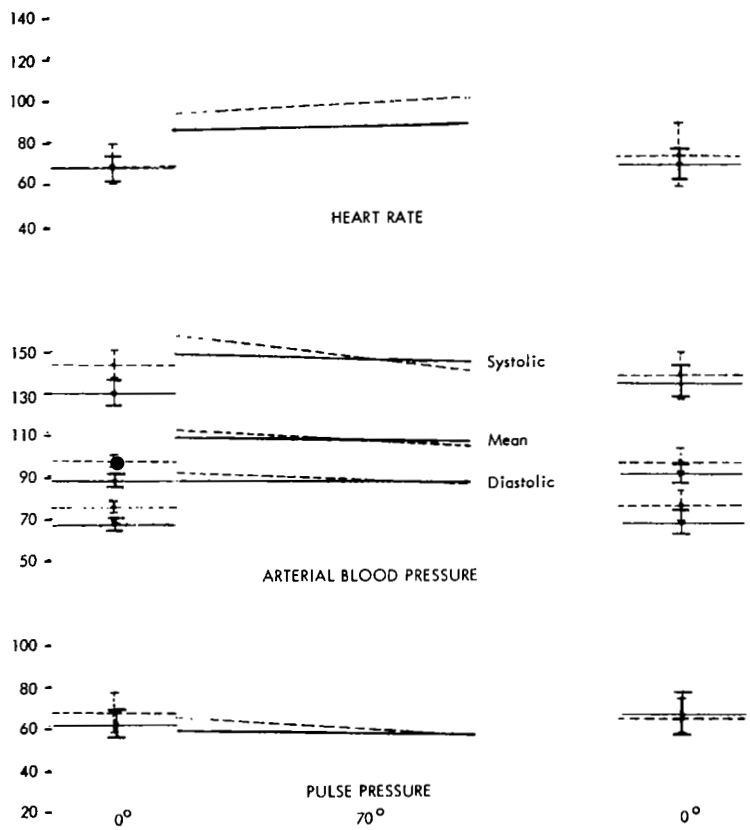


Figure 8

Slopes of the heart rate and arterial blood pressure during passive tilt before and after 14 days of bedrest with exercise. The solid line indicates values before bedrest. The dotted lines indicate values after bedrest. The values presented in this figure represent the averages of the group of 6 subjects.

were not as negative as those obtained after bedrest without exercise.

Table A1 presents the values of the slopes of the heart rate and blood pressure for each subject on each day of testing. Table A2 presents the average values of these slopes for each group of subjects studied on the same day.

B. Changes in the phases of the cardiac cycle

The values of the duration of the different phases of the cardiac cycle and the pulse wave velocities are presented in Tables A3 and A4. As indicated previously the results of the systolic and isotonic ratio include a correction for the changes in heart rate during tilt.

The values of the systolic ratio remained fairly constant and within normal limits throughout the entire tilt procedure before bedrest. Following bedrest the initial values were lower than predicted, but the systolic ratio gradually went up in the course of the tilt (figures 9 and 10).

The isotonic ratio decreased markedly during the tilt before bedrest. This effect was of the same magnitude following bedrest since the values of the isotonic phase were shorter to begin with.

There was a marked rise in the average pulse wave velocity in the position of maximum tilt, but the large coefficient of variation in that situation precludes any confident interpretation of the significance of this finding.

The values of the duration of the different phases of the cardiac cycle in the tilts following bedrest with exercise are very similar to those obtained before bedrest with exercise.

C. Observations in cases of orthostatic hypotension

An analysis of the analogue records of arterial blood pressure, respirations, and instantaneous heart rate revealed that before tilt the blood pressure remained very stable in practically all the subjects with barely noticeable fluctuations due to respiration. The respiration-heart rate response was identifiable in most of the subjects, but it was not of great magnitude. During tilt the fluctuations in blood pressure were more marked in practically all the subjects, the effect of respiration being brought out more clearly. Superimposed upon the respiratory fluctuations in blood pressure, there were other waves with a periodicity ranging between eight and twelve seconds. These fluctuations in blood pressure were accompanied by a change in the heart rate, usually a wave of deceleration paralleling the increase in blood pressure. In the tilts following bedrest the magnitude of the fluctuations was markedly reduced in most individuals and this was more manifest in those who developed syncope in the course of tilt (figures 11 and 12). From a qualitative standpoint, the same findings were present in the tilts following bedrest with isometric exercise.

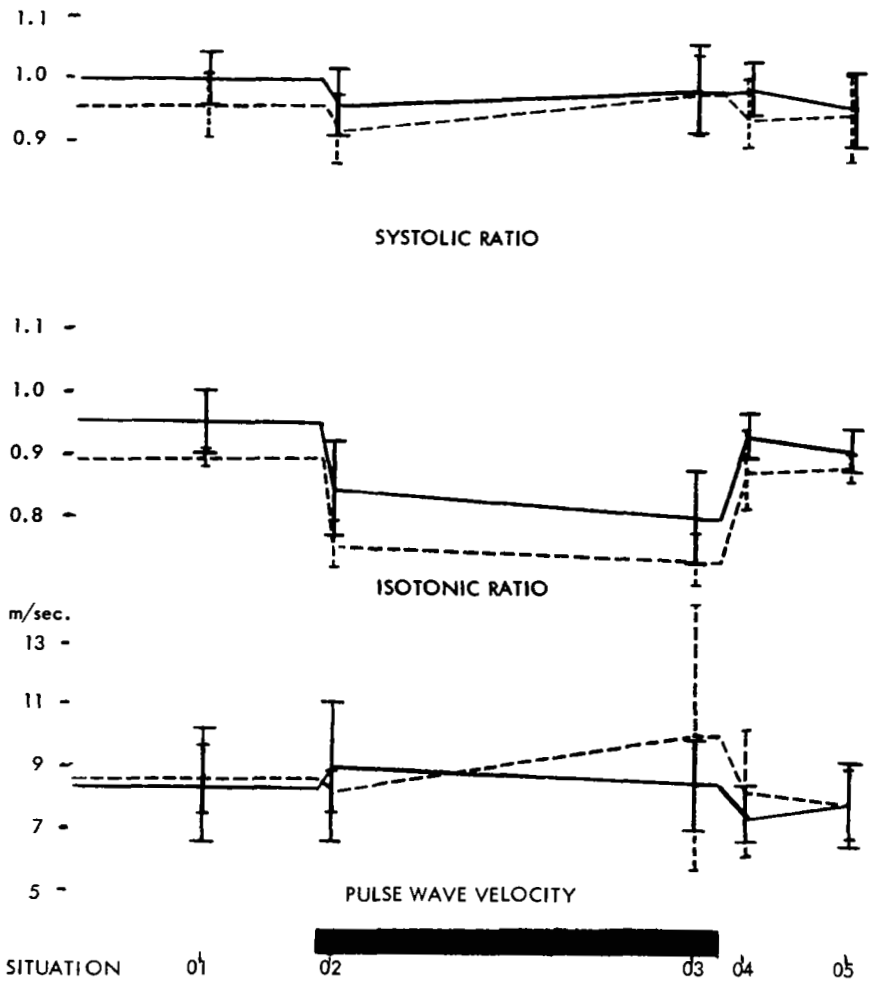


Figure 9

Average changes of the systolic ratio, the isotonic ratio, and the pulse wave velocity during the tilt procedure before and after 14 days of bedrest.

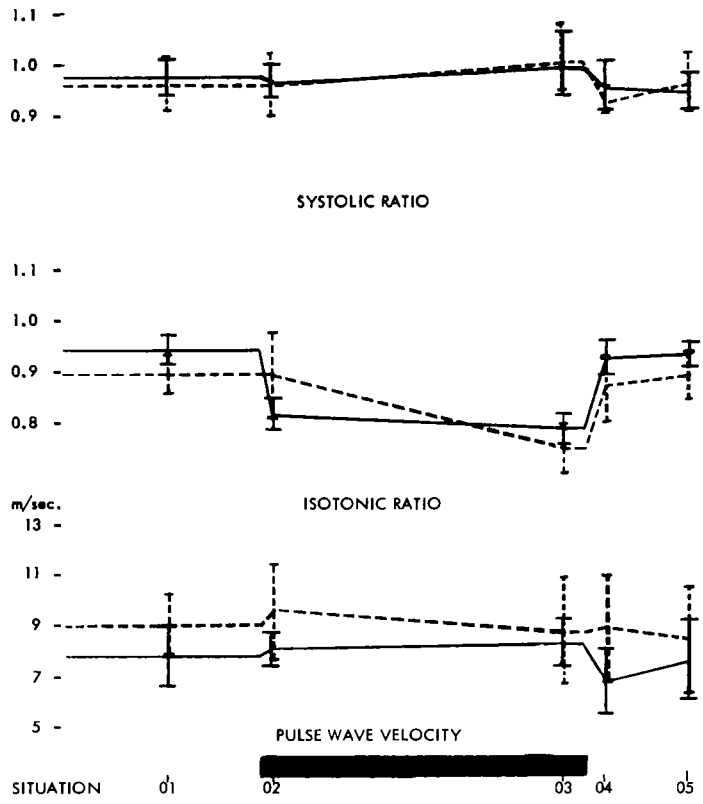


Figure 10

Average changes of the systolic ratio, the isotonic ratio, and the pulse wave velocity during the tilt procedure before and after 14 days of bedrest with exercise.

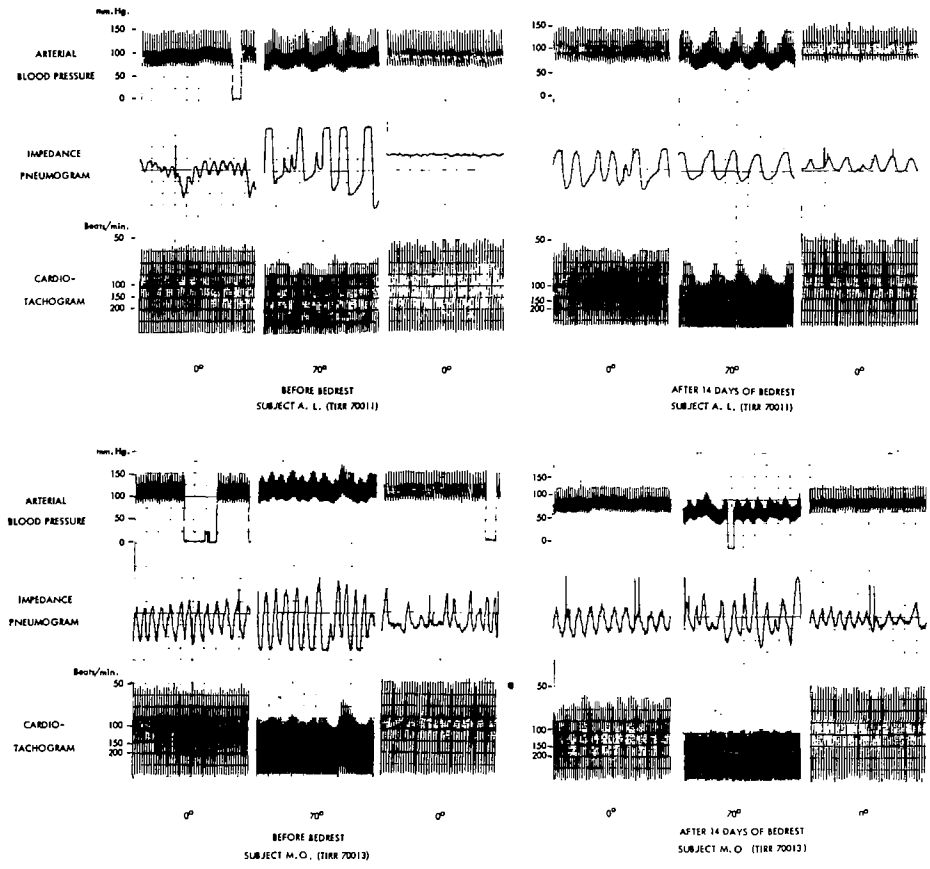
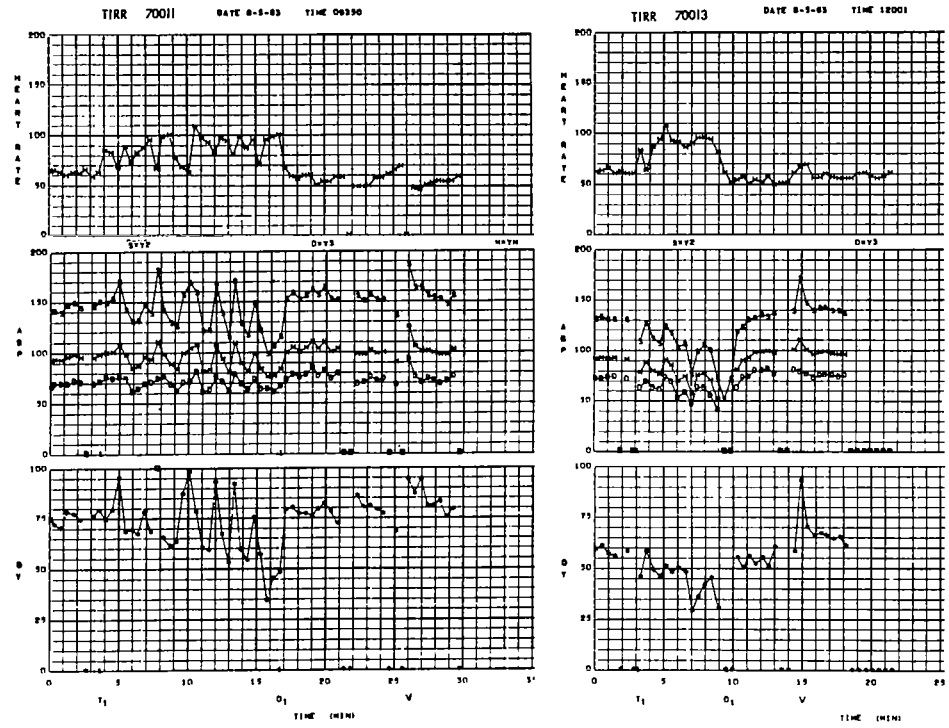


Figure 11

Representative records of the arterial blood pressure, pneumogram, and cardiotachogram during the tilt procedure before and after 14 days of bedrest in subject A. L. who did not develop orthostatic hypotension and in subject M. O. who developed orthostatic hypotension.



ABP = arterial blood pressure; DY = pulse pressure, T_1 = onset of tilt to 70°; D_1 = return to 0°; V = Valsalva maneuver

Figure 12

Computer derived plots of the heart rate, arterial blood pressure, and pulse pressure during the tilt and after bedrest in subject A. L. who did not develop orthostatic hypotension and in subject M. O. who developed orthostatic hypotension.

Impending syncope occurred in the subject W. S. (TIRR # 70008) in the first study even in the tilt before the first period of bedrest. It occurred also in subjects M. O. (TIRR # 70013), D. C. (TIRR # 70014), and C. B. (TIRR # 70016) at the end of the first period of the second study, and in subjects C. B. (TIRR # 70016) and C. P. (TIRR # 70017) at the end of the second period. In all these subjects there was a significant prolongation of the systolic ratio at the situation of maximum tilt just before impending syncope was manifested by a deceleration of heart rate and a further drop in systolic and diastolic pressure. In general, these subjects required a longer time (in excess of three minutes) for the blood pressure and heart rate to reach steady state levels after return to zero degrees.

DISCUSSION

The results of this study of the cardiovascular tolerance to passive tilt showed that a short period of three days of bedrest resulted in "cardiovascular deconditioning" as manifested by a greater increase in the heart rate during the tilts that followed bedrest. There was also a gradual drop in the pulse pressure, which contrasted with its stability in the tilts before bedrest. These same effects were noted also in the second study when bedrest was prolonged for 14 days.

These findings are in agreement with those of previous investigations, but they do not permit the clear establishment of the mechanism of orthostatic hypotension which follows bedrest. Numerous studies have been published on the mechanism of postural hypotension. A well documented account is given by Rushmer.[15] A decrease in venomotor tone, shifts of circulating blood volume, pooling of blood in the extremities, and extravasation of plasma into the tissues are several of the factors incriminated. It is possible that different degrees of interplay among them account for the deterioration in cardiovascular tolerance following prolonged bedrest.

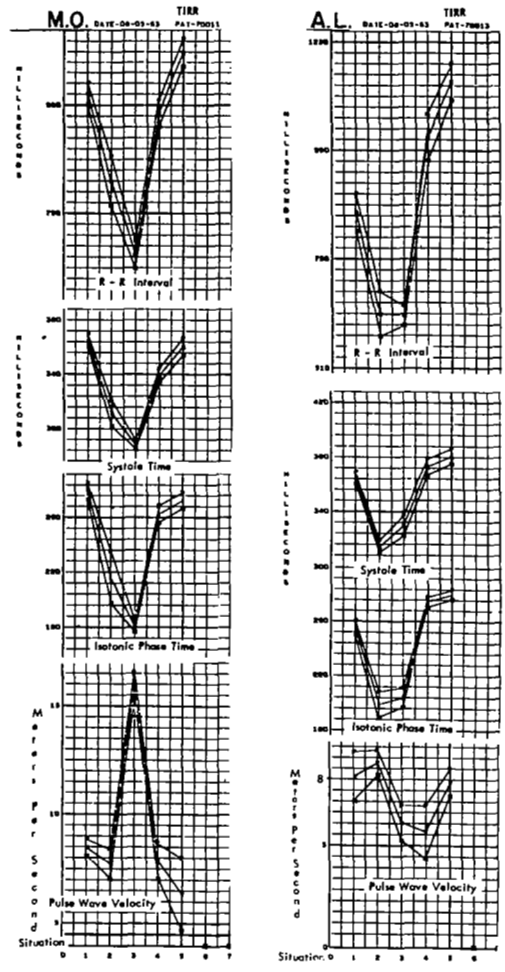
The results of the analysis of the cardiac dynamics, although inconclusive because of their variability, suggest an adrenergic response during passive tilt. This response was more marked in the tilts after bedrest. It was manifested by an increase in the heart rate and in diastolic blood pressure as well as by a shortening of the duration of mechanical systole. Usually, an adrenergic response produces a marked shortening of the time of the isometric phase[10], but in the conditions of tilt, this is precluded by a decreased ventricular filling during diastole because of decreased venous return to the heart. It is likely that in the absence of an adrenergic response, the isometric phase would have been even longer during tilt. Indeed, this was the case in individuals who exhibited syncope, which suggests that these individuals were unable to maintain an adequate adrenergic response to cope with their demands for adequate stroke volumes and cardiac output. The isotonic phase of the contraction is usually shorter during tilt, because the ventricular diastolic filling is smaller, and less time is required for pressure in the pulmonary and aortic arteries to exceed the pressure inside the ventricular cavity and to close the semilunar valves. The increase in the weight of the column of blood over the semilunar valves during the standing position may contribute to an earlier closure of the valves. An increased isometric phase, a decreased isotonic phase, and an over-all decrease of the mechanical systole are therefore normal responses to tilt. These responses indicate that the autonomic nervous system reacts to the effect of gravity on the circulation with an adrenergic reaction.

This reaction aims not only to minimize pooling in the peripheral circulation but to increase the contractility of the myocardium (inotropic action) in order to shorten the time of systole and to increase the duration of diastole thus permitting more adequate filling of the ventricle and the maintenance of an adequate cardiac output.

An excessive adrenergic reaction, however, may increase the heart rate beyond what is needed to maintain an adequate cardiac output. Under these circumstances, the duration of diastole becomes too short to allow for sufficient ventricular filling; and since the venous return is decreased, the cardiac output drops to a critical level. The problem is compounded when the adrenergic reaction is manifested in an increased heart rate not accompanied by a proportional shortening of the systole time. This situation probably is that prevalent when orthostatic hypotension is about to occur, and it was evident in the subjects who exhibited frank hypotension. Figure 13 shows the differences in cardiac dynamics during tilts in two subjects. One subject (TIRR # 70001) tolerated tilt well while the other (TIRR # 70013) developed syncope. In spite of similar heart rates at tilt, the latter had a longer systole. It is interesting that in this person, the fluctuations of the instantaneous heart rate during the position of tilt were markedly dampened. Fluctuations of cardiac deceleration during the upright posture suggest that there is a certain degree of vagal activity. This vagal action is indicative of a control mechanism of negative feedback[16] and may serve the purposes of stabilizing the situation brought about by the increased adrenergic response of the sympathetic which acts as a control of positive feedback (runaway type).[16] The decreased activity of the parasympathetic in the individuals who developed syncope suggests excessive preponderance of the control system of positive feedback (sympathetic) leading to a critical point of decreased cardiac output and hypotension. It is not clear, however, what leads to the marked and persistent bradycardia at the moment of syncope. A precise understanding of the mechanism of this bradycardia deserves further investigation.

The tilts of the subjects after bedrest with isometric exercise did not produce the same type of slopes obtained after bedrest without exercise. This was evident not only in the second study, but in the first study of the group of five subjects (with the exclusion of subject W. S., TIRR # 70008). The program of isometric exercises, though intermittent and of short duration, seemed to permit the subject to maintain more adequate blood pressure in the standing position. Another indication of the protective effect of isometric exercises on the tolerance to passive tilt is given by the changes of heart rate during tilt. These changes were practically identical before and after bedrest with exercise. This contrasted with the increased tachycardia occurring in the tilts after bedrest without exercise.

The measurements of the duration of the cardiac cycle and its phases reveal that the tilts after bedrest with exercise failed to produce the degree of shortening of the isotonic phase that was so marked after the bedrest alone. Because of this, the hemodynamic ratio (duration of isotonic phase / duration of isometric phase) did not drop as much in the tilts after bedrest with exercise as in the tilts at the end of bedrest without exercise. It is felt that this hemodynamic ratio drops significantly in conditions that result in a decreased cardiac output.[9,10]



Situations: 1 = steady state at 0°; 2 = upon reaching 70°; 3 = steady state at 70°;
4 = upon return to 0°; 5 = steady state at 0°

P and N represent the values of one standard deviation
above and below the mean value at each situation.

Figure 13

Computer derived plots of the total duration of the cardiac cycle (RR interval), time of systole, time of isotonic phase, and pulse wave velocity during the tilt procedure in subject A. L. who did not develop orthostatic hypotension and in subject M. O. who developed orthostatic hypotension.

The results of the pulse wave velocity are inconclusive since there is a striking difference in the type of response obtained in the first and in the second study. The large coefficient of variation observed in some sessions of tilt suggest a methodological error of the measurement in the standing position; but this methodological error, if present, was not of the same magnitude on all days.

A precise explanation of the mechanisms involved in the apparent protective effect of isometric exercises is purely speculative in the light of the results obtained. It is possible that physical exercise, although limited, produced enough degree of stimulation of the vasomotor system during bedrest to allow for a quick reflex adaptation to gravitational changes thus preventing pooling of blood in the dependent areas and a shift of fluid from the intravascular to the extracellular space. The venous return would be less affected and the isotonic phase of the contraction would not shorten as much as during the tilts after bedrest. It is possible also that the differences observed were not due to the program of exercise but to the greater adaptation of the subjects to endure the experiment for the second time. A test of this hypothesis is precluded by the experimental design of the two studies. In future tests, it would be desirable to alternate the order of the experiments conducting the bedrest with the exercise program first in some subjects. It is hard to conceive, however, that an adaptation of the subjects to the bedrest experiment would result in a greater adrenergic reaction than in the first period of bedrest without isometric exercises.

In the course of setting up the experimental designs for these two studies, the question was brought up as to whether or not the effects of the first period of bedrest, in regard to the tolerance to tilt, would have disappeared at the initiation of the second period. The results of the tilts done before starting the second period of bedrest in each of the two studies were practically identical to those at the beginning of the first period. However, a statistical test (T test) revealed a small but significant difference ($p<0.05$) in slopes of blood pressure obtained before the second period of the second study. A passive tilt test (without intra-arterial puncture) was done nine days after ending the first 14 day period of bedrest. All the individuals had a cardiovascular tolerance to tilt and circulatory dynamic values comparable to those before bedrest. Likewise, a passive tilt test done five days after the second period of the second study showed that all the subjects had returned to pre-bedrest values.

RESULTS

These studies, aimed at determining the cardiovascular effects of short-term (3 days) and long-term (14 days) bedrest, showed that there was a deterioration of the subjects' ability to tolerate passive tilt. The deterioration was demonstrated by the negative slopes of the regressional line of blood pressure vs. time and the positive slopes of heart rate vs. time observed during tilt procedures at the end of the period of bedrest. The intolerance to tilt was more evident after bedrest for 14 days. This study showed also that isometric exercises performed while on bedrest improved the subjects' tolerance to passive tilt, as evidenced in the slopes of blood pressure, which although negative, were less steep.

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APPENDIX

TABLE A1
VALUES OF CIRCULATORY DYNAMICS ON EACH INDIVIDUAL

SUBJECT # 70001 **DATE 5/ 6/63**

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	165.0	5.5	168.8	5.7	-2.12	3.6	8	.3
BP DIAST	109.4	3.7	114.9	3.5	-3.09	2.1	8	1.9
H. R.	90.1	2.9	82.6	1.7	4.19	1.0	8	15.5
PULSE PRESS	55.6	2.8	53.9	3.0	.96	1.8	8	.2
MEAN PRESS	128.0	4.1	132.6	4.1	-2.55	2.5	8	.9

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	157.6	6.7	11
BP DIAST	97.0	5.5	11
H. R.	64.7	6.9	13
PULSE PRESS	60.6	2.2	11
MEAN PRESS	117.2	6.0	11

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	171.4	12.1	180.9	11.0	-4.17	2.0	17	4.1
BP DIAST	108.3	6.7	113.7	6.1	-2.35	1.1	17	4.3
H. R.	91.2	9.6	92.5	9.9	-.56	1.8	18	.0
PULSE PRESS	63.0	8.1	67.2	8.0	-1.81	1.4	17	1.4
MEAN PRESS	129.3	8.0	135.9	7.1	-2.93	1.3	17	4.8

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	158.0	3.8	13
BP DIAST	95.3	3.9	13
H. R.	69.0	8.2	13
PULSE PRESS	62.6	2.3	13
MEAN PRESS	116.1	3.6	13

TABLE A1 (continued)

SUBJECT # 70006 DATE 5/ 6/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	124.2	2.5	8
BP DIAST	80.1	2.9	8
H. R.	79.5	3.0	12
PULSE PRESS	44.1	3.2	8
MEAN PRESS	95.0	2.4	8

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	132.3	2.4	136.1	1.5	-1.48	.4	8	11.4
BP DIAST	89.2	1.8	90.5	1.8	-.52	.5	8	.9
H. R.	91.8	5.7	91.2	6.0	.19	1.3	10	.0
PULSE PRESS	43.1	2.5	45.5	2.4	-.96	.6	8	1.9
MEAN PRESS	103.6	1.9	105.9	1.6	-.92	.4	8	4.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	130.6	2.0	3
BP DIAST	81.6	3.2	3
H. R.	81.3	10.3	6
PULSE PRESS	49.0	3.0	3
MEAN PRESS	97.6	2.5	3

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	139.7	12.1	142.1	13.0	-.72	3.0	8	.0
BP DIAST	95.6	3.3	90.2	2.3	1.61	.5	8	8.4
H. R.	91.5	14.7	97.2	15.0	-1.83	2.5	12	.5
PULSE PRESS	44.1	12.4	51.8	12.8	-2.33	3.0	8	.5
MEAN PRESS	110.4	4.6	107.8	4.8	.79	1.1	8	.4

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	128.0	1.8	4
BP DIAST	82.5	3.8	4
H. R.	70.4	3.1	7
PULSE PRESS	45.5	3.5	4
MEAN PRESS	97.5	2.8	4

TABLE A1 (continued)

SUBJECT # 70007 DATE 5/ 6/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	133.5	4.7	4
BP DIAST	76.5	1.7	4
H. R.	85.8	4.0	6
PULSE PRESS	57.0	4.2	4
MEAN PRESS	95.7	2.2	4

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	142.4	6.1	139.8	6.6	1.76	3.3	6	.2
BP DIAST	95.5	6.7	91.6	7.0	2.71	3.5	6	.5
H. R.	101.5	4.1	96.8	3.3	3.24	1.7	6	3.6
PULSE PRESS	46.8	7.8	48.1	8.7	-.94	4.4	6	.0
MEAN PRESS	111.0	5.6	107.8	5.8	2.22	2.9	6	.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	136.4	7.7	5
BP DIAST	82.4	4.3	5
H. R.	87.5	7.2	7
PULSE PRESS	54.0	5.5	5
MEAN PRESS	100.4	5.2	5

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	148.7	17.7	142.6	18.1	2.38	3.1	11	.5
BP DIAST	99.5	8.7	97.0	8.9	.96	1.5	11	.3
H. R.	96.0	8.9	95.6	9.4	.17	1.6	12	.0
PULSE PRESS	49.1	11.6	45.5	11.9	1.41	2.0	11	.4
MEAN PRESS	116.0	11.2	112.2	11.4	1.47	1.9	11	.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	142.6	6.6	6
BP DIAST	87.0	6.9	6
H. R.	86.2	10.9	7
PULSE PRESS	55.6	4.2	6
MEAN PRESS	105.5	6.4	6

TABLE A1 (continued)

SUBJECT # 70008 DATE 5/ 6/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	123.7	4.4	7
BP DIAST	66.7	3.0	7
H. R.	69.3	3.9	8
PULSE PRESS	57.0	2.2	7
MEAN PRESS	85.5	3.4	7

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	125.7	21.4	163.9	5.8	-21.38	3.4	4	37.9
BP DIAST	76.2	14.2	100.6	6.1	-13.63	3.6	4	14.1
H. R.	86.1	3.3	83.9	3.4	1.40	1.7	6	.6
PULSE PRESS	49.5	7.9	63.3	2.9	-7.75	1.7	4	20.0
MEAN PRESS	93.0	16.4	121.7	5.9	-16.07	3.5	4	20.6

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	121.7	4.2	4
BP DIAST	74.4	29.4	5
H. R.	58.7	2.4	7
PULSE PRESS	60.5	4.7	4
MEAN PRESS	81.2	1.5	4

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	137.3	18.6	203.1	12.9	-10.28	3.3	9	9.5
BP DIAST	84.7	11.4	123.3	8.4	-6.02	2.1	9	7.8
H. R.	97.1	5.8	86.9	5.7	1.58	1.4	9	1.1
PULSE PRESS	52.5	8.6	79.7	6.8	-4.25	1.7	9	5.8
MEAN PRESS	102.2	13.6	150.3	9.4	-7.52	2.4	9	9.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	122.5	7.0	4
BP DIAST	66.2	6.8	4
H. R.	61.8	4.3	7
PULSE PRESS	56.2	7.6	4
MEAN PRESS	84.7	5.8	4

TABLE A1 (continued)

SUBJECT # 70009 DATE 5/ 6/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	122.6	2.8	18
BP DIAST	73.0	2.8	18
H. R.	91.8	4.9	20
PULSE PRESS	49.6	2.1	18
MEAN PRESS	89.6	2.6	18

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	137.0	6.2	129.6	4.3	2.77	.5	22	22.2
BP DIAST	90.8	8.1	79.2	4.2	4.33	.5	22	59.3
H. R.	99.4	5.4	99.7	5.5	-.12	.7	22	.0
PULSE PRESS	46.2	3.7	50.4	2.8	-1.56	.3	22	17.1
MEAN PRESS	106.2	7.3	96.0	4.0	3.80	.5	22	49.2

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	135.9	1.4	12
BP DIAST	81.5	2.2	12
H. R.	89.6	3.7	12
PULSE PRESS	54.4	1.7	12
MEAN PRESS	99.6	1.9	12

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	139.8	3.8	136.4	3.9	1.16	1.3	12	.7
BP DIAST	91.4	2.8	89.2	2.9	.74	.9	12	.5
H. R.	100.7	4.3	101.8	4.5	-.36	1.5	12	.0
PULSE PRESS	48.4	2.1	47.2	2.1	.41	.7	12	.3
MEAN PRESS	107.5	3.2	105.4	3.3	.74	1.1	12	.4

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	135.2	12.1	8
BP DIAST	82.5	10.9	8
H. R.	85.4	4.2	13
PULSE PRESS	52.7	1.8	8
MEAN PRESS	100.0	11.5	8

TABLE A1 (continued)

SUBJECT # 70010 DATE 5/ 6/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	129.4	3.0	9
BP DIAST	82.3	3.0	9
H. R.	80.7	2.4	18
PULSE PRESS	47.1	1.9	9
MEAN PRESS	98.0	3.0	9

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	152.1	5.9	143.1	3.4	3.71	.7	15	27.2
BP DIAST	101.1	3.7	96.9	3.1	1.72	.6	15	7.3
H. R.	99.0	3.6	94.6	2.8	1.82	.5	18	12.5
PULSE PRESS	51.0	3.1	46.2	1.8	1.99	.3	15	28.6
MEAN PRESS	118.1	4.4	112.1	3.1	2.47	.6	15	14.9

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	138.3	3.7	12
BP DIAST	83.4	4.8	12
H. R.	87.5	6.5	13
PULSE PRESS	54.9	2.9	12
MEAN PRESS	101.7	4.3	12

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	156.3	4.7	160.1	4.7	-1.10	1.2	14	.7
BP DIAST	103.8	3.4	101.9	3.5	.57	.9	14	.3
H. R.	95.2	3.6	88.0	3.0	2.14	.8	14	7.0
PULSE PRESS	52.5	3.2	58.1	2.8	-1.68	.7	14	4.8
MEAN PRESS	121.3	3.6	121.6	3.7	-.06	1.0	14	.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	135.0	4.4	12
BP DIAST	81.9	3.5	12
H. R.	83.0	5.7	13
PULSE PRESS	53.0	2.1	12
MEAN PRESS	99.6	3.7	12

TABLE A1 (continued)

SUBJECT # 70001 DATE 5/ 9/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	141.7	3.4	4
BP DIAST	90.2	1.7	4
H. R.	67.7	2.4	8
PULSE PRESS	51.5	2.6	4
MEAN PRESS	107.2	2.2	4

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	156.2	9.2	152.5	9.1	.71	.6	22	1.3
BP DIAST	108.0	6.7	104.0	6.3	.79	.4	22	3.4
H. R.	96.7	6.7	88.3	4.3	1.62	.2	22	30.9
PULSE PRESS	48.1	5.6	48.5	5.7	-.07	.3	22	.0
MEAN PRESS	124.0	7.1	120.2	6.9	.75	.4	22	2.6

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	158.7	9.5	4
BP DIAST	96.0	5.9	4
H. R.	64.8	3.5	6
PULSE PRESS	62.7	3.7	4
MEAN PRESS	117.2	7.1	4

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	172.7	14.2	206.3	4.4	-23.95	4.4	4	28.6
BP DIAST	111.0	1.2	108.1	.6	2.06	.6	4	11.2
H. R.	79.5	15.8	41.5	3.3	27.03	3.3	4	66.2
PULSE PRESS	61.7	15.5	98.2	5.0	-26.02	5.0	4	26.3
MEAN PRESS	131.7	3.8	141.0	.8	-6.58	.8	4	54.2

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	151.3	4.8	6
BP DIAST	97.1	3.6	6
H. R.	75.4	17.8	7
PULSE PRESS	54.1	5.6	6
MEAN PRESS	115.0	3.0	6

TABLE A1 (continued)

SUBJECT # 70006 DATE 5/ 9/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	138.8	6.3	6
BP DIAST	82.5	4.8	6
H. R.	90.3	6.8	8
PULSE PRESS	56.3	3.2	6
MEAN PRESS	101.0	5.0	6

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	141.8	6.6	148.3	5.6	-1.43	.5	19	7.8
BP DIAST	97.8	4.4	99.5	4.4	-.37	.4	19	.8
H. R.	109.4	7.1	98.1	3.2	2.35	.2	20	74.3
PULSE PRESS	44.0	3.4	48.8	2.1	-1.06	.1	19	30.2
MEAN PRESS	112.3	5.0	115.8	4.8	-.76	.4	19	3.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	133.6	8.3	8
BP DIAST	85.0	6.2	8
H. R.	97.3	16.0	8
PULSE PRESS	48.6	4.3	8
MEAN PRESS	101.3	6.4	8

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	134.2	23.3	156.0	18.1	-10.10	4.0	9	6.2
BP DIAST	103.3	8.8	108.0	8.7	-2.17	1.9	9	1.2
H. R.	106.6	6.9	101.3	6.3	2.42	1.4	10	2.9
PULSE PRESS	30.8	15.8	48.0	10.2	-7.93	2.2	9	12.0
MEAN PRESS	113.5	13.2	123.8	11.6	-4.78	2.6	9	3.3

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	130.7	4.6	7
BP DIAST	85.4	3.4	7
H. R.	89.0	2.4	8
PULSE PRESS	45.2	6.1	7
MEAN PRESS	100.5	2.4	7

TABLE A1 (continued)

SUBJECT # 70007 DATE 5/ 9/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	136.5	.7	2
BP DIAST	80.5	2.1	2
H. R.	89.3	7.1	6
PULSE PRESS	56.0	1.4	2
MEAN PRESS	99.0	1.4	2

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	139.3	5.2	141.7	5.1	-.53	.4	19	1.7
BP DIAST	98.5	4.1	98.4	4.2	.01	.3	19	.0
H. R.	117.6	4.6	114.7	4.3	.61	.3	18	3.2
PULSE PRESS	40.8	3.7	43.3	3.4	-.54	.2	19	4.0
MEAN PRESS	112.0	4.2	113.0	4.3	-.21	.3	19	.3

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	134.0	2.7	7
BP DIAST	84.0	1.5	7
H. R.	88.4	8.7	7
PULSE PRESS	50.0	2.7	7
MEAN PRESS	100.7	1.4	7

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	144.0	6.0	143.4	6.6	.37	2.1	7	.0
BP DIAST	100.3	2.8	100.3	3.1	-.02	1.0	7	.0
H. R.	109.3	6.8	101.0	4.1	4.78	1.3	8	13.5
PULSE PRESS	43.7	5.1	43.0	5.5	.39	1.7	7	.0
MEAN PRESS	115.0	3.7	114.7	4.1	.17	1.3	7	.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	145.6	7.3	6
BP DIAST	92.0	6.6	6
H. R.	91.2	7.1	7
PULSE PRESS	53.6	3.4	6
MEAN PRESS	109.8	6.6	6

TABLE A1 (continued)

SUBJECT # 70008 DATE 5/ 9/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	129.1	3.6	8
BP DIAST	76.1	3.0	8
H. R.	59.5	2.3	10
PULSE PRESS	53.0	3.8	8
MEAN PRESS	93.8	2.6	8

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	117.0	19.8	149.6	5.0	-27.46	3.1	6	74.7
BP DIAST	77.2	13.1	97.4	4.3	-19.89	3.4	5	33.3
H. R.	92.8	5.3	89.5	5.5	2.73	3.5	6	.5
PULSE PRESS	44.8	6.0	51.4	5.1	-6.52	4.0	5	2.5
MEAN PRESS	92.2	14.5	114.7	4.2	-22.14	3.3	5	43.1

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	116.5	10.5	10
BP DIAST	64.8	7.5	10
H. R.	61.2	5.1	10
PULSE PRESS	51.7	3.9	10
MEAN PRESS	82.0	8.5	10

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	113.4	14.8	137.3	5.9	-6.37	.7	16	79.4
BP DIAST	78.7	8.2	90.9	4.5	-3.25	.5	16	35.8
H. R.	100.6	6.3	95.0	5.7	1.54	.6	18	5.1
PULSE PRESS	34.6	7.2	46.3	2.9	-3.12	.3	16	79.4
MEAN PRESS	90.3	10.2	106.1	4.7	-4.23	.5	16	54.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	114.0	14.2	8
BP DIAST	65.2	4.2	8
H. R.	68.7	16.6	9
PULSE PRESS	48.7	10.4	8
MEAN PRESS	81.5	7.5	8

TABLE A1 (continued)

SUBJECT # 70009 DATE 5/ 9/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	126.5	3.3	4
BP DIAST	77.0	.8	4
H. R.	83.7	2.9	8
PULSE PRESS	49.5	2.5	4
MEAN PRESS	93.5	1.7	4

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	130.5	7.8	138.2	6.3	-1.62	.5	15	8.5
BP DIAST	92.7	6.1	96.2	5.9	-.74	.5	15	2.0
H. R.	112.1	9.7	104.8	8.8	1.55	.6	20	5.0
PULSE PRESS	37.8	5.1	41.9	4.5	-.87	.4	15	4.7
MEAN PRESS	105.2	6.3	110.2	5.6	-1.04	.4	15	4.3

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	131.7	4.6	7
BP DIAST	78.5	6.0	7
H. R.	83.2	7.8	7
PULSE PRESS	53.1	3.2	7
MEAN PRESS	96.4	5.5	7

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	143.8	16.2	146.1	17.4	-1.38	5.5	8	.0
BP DIAST	93.5	7.1	92.2	7.6	.82	2.3	8	.1
H. R.	96.6	12.0	90.7	12.1	3.51	3.8	8	.8
PULSE PRESS	50.2	9.7	53.9	10.1	-2.21	3.2	8	.4
MEAN PRESS	110.3	10.1	110.3	10.9	.02	3.4	8	.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	134.0	10.1	7
BP DIAST	83.5	4.9	7
H. R.	86.5	13.3	7
PULSE PRESS	50.4	5.7	7
MEAN PRESS	100.4	6.5	7

TABLE A1 (continued)

SUBJECT # 70010 DATE 5/ 9/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	137.4	4.0	9
BP DIAST	82.4	3.1	9
H. R.	91.8	6.0	10
PULSE PRESS	55.0	3.1	9
MEAN PRESS	100.8	3.3	9

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	135.8	7.4	139.0	7.3	-.56	.4	22	1.2
BP DIAST	96.3	6.6	96.7	6.8	-.08	.4	22	.0
H. R.	109.5	4.3	102.9	2.2	1.15	.1	22	58.5
PULSE PRESS	39.5	3.8	42.2	3.5	-.48	.2	22	4.0
MEAN PRESS	109.4	6.5	110.8	6.6	-.24	.4	22	.2

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	133.5	9.1	7
BP DIAST	83.2	6.8	7
H. R.	89.5	4.5	7
PULSE PRESS	50.2	2.8	7
MEAN PRESS	100.0	7.5	7

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	134.2	6.1	133.3	6.5	.43	1.4	10	.0
BP DIAST	89.1	5.5	86.2	5.5	1.31	1.2	10	1.1
H. R.	105.9	5.3	100.0	3.6	2.70	.8	10	10.9
PULSE PRESS	45.1	3.8	47.0	3.7	-.87	.8	10	1.0
MEAN PRESS	104.3	5.5	102.2	5.6	.95	1.2	10	.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	126.0	11.8	5
BP DIAST	75.0	7.2	5
H. R.	94.5	9.6	7
PULSE PRESS	51.0	6.3	5
MEAN PRESS	92.0	8.5	5

TABLE A1 (continued)

SUBJECT # 70001 DATE 5/20/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	159.0	.0	1
BP DIAST	89.0	.0	1
H. R.	62.0	1.1	4
PULSE PRESS	70.0	.0	1
MEAN PRESS	112.0	.0	1

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	173.0	7.7	164.0	4.7	5.84	1.7	7	10.9
BP DIAST	113.7	3.8	110.1	3.0	2.36	1.1	7	4.4
H. R.	87.7	6.4	87.5	6.9	.13	2.2	8	.0
PULSE PRESS	59.2	5.0	53.8	3.5	3.48	1.3	7	7.1
MEAN PRESS	133.4	5.1	127.8	3.4	3.67	1.2	7	8.4

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	168.1	2.1	7
BP DIAST	95.5	1.9	7
H. R.	65.7	5.3	7
PULSE PRESS	72.5	2.9	7
MEAN PRESS	119.7	1.4	7

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	177.2	7.3	183.2	6.5	-1.12	.4	21	6.0
BP DIAST	113.3	4.1	112.2	4.1	.22	.2	21	.5
H. R.	91.5	9.0	81.2	6.8	1.85	.4	22	16.1
PULSE PRESS	63.8	6.9	71.0	5.5	-1.35	.3	21	11.9
MEAN PRESS	134.6	4.3	135.8	4.4	-.21	.3	21	.4

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	166.8	4.5	6
BP DIAST	98.5	2.1	6
H. R.	67.5	8.9	7
PULSE PRESS	68.3	2.7	6
MEAN PRESS	121.1	2.7	6

TABLE A1 (continued)

SUBJECT # 70006 DATE 5/20/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	147.0	.0	2
BP DIAST	85.5	.7	2
H. R.	63.2	3.3	4
PULSE PRESS	61.5	.7	2
MEAN PRESS	106.0	.0	2

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	154.7	4.1	153.5	4.3	.54	.9	10	.3
BP DIAST	99.1	5.5	100.2	5.7	-.52	1.2	10	.1
H. R.	76.2	8.0	78.5	8.4	-1.09	1.8	10	.3
PULSE PRESS	55.6	4.0	53.3	3.9	1.06	.8	10	1.4
MEAN PRESS	117.7	4.8	117.9	5.1	-.11	1.1	10	.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	146.5	4.0	7
BP DIAST	86.2	3.4	7
H. R.	65.4	7.1	7
PULSE PRESS	60.2	3.3	7
MEAN PRESS	106.4	3.1	7

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	150.0	5.6	149.8	5.8	.05	.4	20	.0
BP DIAST	96.3	3.8	94.6	3.8	.36	.2	20	1.4
H. R.	77.9	6.1	73.1	5.5	.99	.4	20	5.3
PULSE PRESS	53.7	3.3	55.1	3.3	-.30	.2	20	1.4
MEAN PRESS	114.2	4.3	113.1	4.3	.23	.3	20	.4

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	148.7	5.9	7
BP DIAST	87.1	5.1	7
H. R.	70.1	9.7	7
PULSE PRESS	61.5	2.6	7
MEAN PRESS	107.4	5.2	7

TABLE A1 (continued)

SUBJECT # 70007 DATE 5/20/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	121.0	4.2	2
BP DIAST	76.5	4.9	2
H. R.	61.1	3.5	6
PULSE PRESS	44.5	.7	2
MEAN PRESS	91.5	4.9	2

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	135.0	10.5	125.0	5.9	7.31	2.3	5	9.6
BP DIAST	90.0	9.4	80.3	3.5	7.11	1.4	5	25.1
H. R.	79.2	9.4	70.7	7.9	5.03	2.5	8	3.8
PULSE PRESS	45.0	7.0	44.7	8.1	.20	3.2	5	.0
MEAN PRESS	105.2	9.3	95.3	2.5	7.25	1.0	5	52.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	119.6	4.3	5
BP DIAST	76.4	8.4	5
H. R.	63.5	3.9	7
PULSE PRESS	43.2	9.9	5
MEAN PRESS	90.6	5.5	5

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	154.3	6.8	164.6	6.0	-1.48	.6	16	5.1
BP DIAST	103.1	5.1	113.3	3.8	-1.48	.4	16	12.6
H. R.	77.0	8.6	77.5	8.9	-.06	.6	20	.0
PULSE PRESS	51.2	5.6	51.2	5.8	.00	.6	16	.0
MEAN PRESS	120.1	5.1	130.4	3.8	-1.48	.4	16	12.7

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	137.7	9.4	7
BP DIAST	82.1	7.0	7
H. R.	65.7	5.6	7
PULSE PRESS	55.5	4.2	7
MEAN PRESS	100.7	7.5	7

TABLE A1 (continued)

SUBJECT # 70008 DATE 5/20/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	131.0	.0	1
BP DIAST	66.0	.0	1
H. R.	72.2	10.8	4
PULSE PRESS	65.0	.0	1
MEAN PRESS	88.0	.0	1

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	144.8	4.7	140.9	4.1	2.34	1.2	8	3.2
BP DIAST	89.3	4.1	84.9	2.8	2.65	.8	8	8.8
H. R.	87.5	3.3	85.6	3.2	.85	.7	10	1.3
PULSE PRESS	55.5	1.6	56.0	1.6	-.30	.5	8	.3
MEAN PRESS	107.8	4.2	103.6	3.2	2.54	1.0	8	6.2

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	133.0	4.5	7
BP DIAST	70.1	1.9	7
H. R.	62.5	6.3	7
PULSE PRESS	62.8	4.8	7
MEAN PRESS	91.1	2.1	7

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	154.3	7.8	160.4	7.0	-1.44	.6	18	5.0
BP DIAST	94.8	5.1	92.0	4.9	.65	.4	18	2.0
H. R.	82.6	6.4	74.9	4.3	1.49	.2	22	25.8
PULSE PRESS	59.5	7.0	68.3	4.5	-2.09	.4	18	25.7
MEAN PRESS	114.7	5.1	114.8	5.3	-.01	.4	18	.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	129.0	6.4	4
BP DIAST	68.0	5.4	4
H. R.	56.3	6.3	6
PULSE PRESS	61.0	8.4	4
MEAN PRESS	88.2	4.2	4

TABLE A1 (continued)

SUBJECT # 70009 DATE 5/20/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	133.0	.0	1
BP DIAST	78.0	.0	1
H. R.	79.5	3.3	6
PULSE PRESS	55.0	.0	1
MEAN PRESS	96.0	.0	1

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	143.5	6.9	131.8	3.6	5.03	1.1	8	18.6
BP DIAST	94.4	3.4	89.4	2.4	2.11	.7	8	7.3
H. R.	98.7	3.6	92.6	1.9	2.62	.6	8	18.3
PULSE PRESS	49.1	4.6	42.3	3.2	2.92	1.0	8	7.8
MEAN PRESS	110.9	4.2	103.9	2.4	3.00	.7	8	15.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	140.4	1.3	7
BP DIAST	79.2	1.3	7
H. R.	82.5	5.9	7
PULSE PRESS	61.1	1.5	7
MEAN PRESS	99.5	1.2	7

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	149.5	5.0	148.8	5.1	.11	.4	18	.0
BP DIAST	96.8	3.5	92.3	2.9	.75	.2	18	7.8
H. R.	97.3	4.3	91.8	3.1	1.03	.2	19	18.2
PULSE PRESS	52.7	4.0	56.5	3.7	-.63	.3	18	3.4
MEAN PRESS	114.4	3.7	111.1	3.5	.55	.3	18	3.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	140.4	3.3	5
BP DIAST	80.0	1.7	5
H. R.	83.2	6.7	7
PULSE PRESS	60.4	3.4	5
MEAN PRESS	100.2	1.9	5

TABLE A1 (continued)

SUBJECT # 70010 DATE 5/20/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	142.0	2.8	2
BP DIAST	88.0	1.4	2
H. R.	82.3	5.0	6
PULSE PRESS	54.0	1.4	2
MEAN PRESS	106.0	1.4	2

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	158.2	7.2	153.6	7.0	2.69	2.2	8	1.4
BP DIAST	106.3	5.4	103.0	5.3	1.93	1.6	8	1.2
H. R.	91.5	6.2	89.2	6.3	1.02	1.4	10	.5
PULSE PRESS	51.8	3.1	50.5	3.2	.76	1.0	8	.5
MEAN PRESS	123.5	5.7	119.9	5.6	2.08	1.7	8	1.3

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	138.1	3.4	7
BP DIAST	84.4	2.9	7
H. R.	85.4	8.7	7
PULSE PRESS	53.7	1.8	7
MEAN PRESS	102.4	2.9	7

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	162.5	8.0	164.1	8.1	-.29	.5	21	.2
BP DIAST	114.3	7.3	114.5	7.5	-.03	.5	22	.0
H. R.	94.7	9.2	89.7	8.9	.96	.6	22	2.5
PULSE PRESS	49.0	4.6	52.2	4.3	-.59	.3	21	3.8
MEAN PRESS	129.9	6.6	129.2	6.8	.11	.4	21	.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	141.1	5.0	7
BP DIAST	87.5	4.3	7
H. R.	83.7	4.7	7
PULSE PRESS	53.5	1.7	7
MEAN PRESS	105.4	4.4	7

TABLE A1 (continued)

SUBJECT # 70001 DATE 5/23/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	141.0	4.2	2
BP DIAST	87.5	3.5	2
H. R.	60.2	1.5	8
PULSE PRESS	53.5	.7	2
MEAN PRESS	105.5	3.5	2

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	159.6	9.1	156.5	9.2	1.71	2.0	16	.6
BP DIAST	110.0	6.6	104.2	5.7	3.18	1.2	16	6.1
H. R.	90.8	10.5	80.7	8.6	4.89	1.6	18	9.1
PULSE PRESS	49.6	4.9	52.2	4.7	-1.47	1.0	16	1.9
MEAN PRESS	126.5	7.2	121.7	6.7	2.62	1.5	16	3.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	156.4	4.3	13
BP DIAST	97.0	3.6	13
H. R.	68.0	12.8	13
PULSE PRESS	59.4	2.8	13
MEAN PRESS	116.7	3.7	13

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	167.9	9.6	167.2	9.8	.08	.7	33	.0
BP DIAST	119.6	5.4	117.0	5.5	.34	.3	33	.7
H. R.	102.7	7.1	93.3	6.5	1.20	.4	34	6.9
PULSE PRESS	48.2	7.0	50.1	7.1	-.25	.5	33	.2
MEAN PRESS	135.7	6.4	133.7	6.5	.25	.4	33	.2

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	170.2	5.1	11
BP DIAST	106.0	3.2	11
H. R.	67.5	8.0	13
PULSE PRESS	64.1	3.2	11
MEAN PRESS	127.4	3.7	11

TABLE A1 (continued)

SUBJECT # 70006 DATE 5/23/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	133.5	3.5	2
BP DIAST	84.0	4.2	2
H. R.	75.8	6.6	6
PULSE PRESS	49.5	.7	2
MEAN PRESS	100.5	3.5	2

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	132.5	6.6	133.7	6.9	-.56	1.7	13	.1
BP DIAST	91.6	5.4	93.3	5.5	-.81	1.4	13	.3
H. R.	97.5	4.6	91.5	3.4	2.40	.6	15	12.3
PULSE PRESS	40.8	3.8	40.3	4.0	.25	1.0	13	.0
MEAN PRESS	105.3	5.4	106.6	5.6	-.64	1.4	13	.2

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	136.3	3.7	13
BP DIAST	85.3	3.0	13
H. R.	76.3	13.2	13
PULSE PRESS	51.0	3.8	13
MEAN PRESS	102.3	2.7	13

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	134.0	6.3	133.2	6.3	.15	.3	39	.1
BP DIAST	97.6	6.0	94.7	5.8	.57	.3	39	3.3
H. R.	103.7	6.4	97.0	5.2	1.20	.2	44	23.7
PULSE PRESS	36.3	4.9	38.4	4.7	-.42	.2	39	2.6
MEAN PRESS	109.7	5.6	107.4	5.5	.44	.3	39	2.2

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	130.3	2.8	6
BP DIAST	83.6	4.0	6
H. R.	71.3	3.3	6
PULSE PRESS	46.6	2.9	6
MEAN PRESS	99.1	3.6	6

TABLE A1 (continued)

SUBJECT # 70007 DATE 5/23/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	125.2	7.9	9
BP DIAST	78.5	4.5	9
H. R.	77.0	9.5	16
PULSE PRESS	46.6	5.4	9
MEAN PRESS	94.1	5.4	9

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	137.8	12.5	135.6	12.9	1.06	2.9	15	.1
BP DIAST	96.2	6.6	92.8	6.6	1.59	1.4	15	1.1
H. R.	100.2	10.4	101.3	10.7	-.47	1.9	18	.0
PULSE PRESS	41.6	7.5	42.7	7.7	-.52	1.7	15	.0
MEAN PRESS	110.1	8.2	107.2	8.3	1.40	1.8	15	.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	142.2	9.9	13
BP DIAST	83.6	4.0	13
H. R.	72.5	14.7	13
PULSE PRESS	58.6	9.8	13
MEAN PRESS	103.3	4.7	13

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	146.9	13.5	148.9	13.7	-.36	.7	41	.2
BP DIAST	109.3	8.2	106.0	8.1	.58	.4	41	1.8
H. R.	111.2	7.4	103.8	6.1	1.37	.2	44	21.6
PULSE PRESS	37.6	8.2	42.8	7.7	-.95	.4	41	5.4
MEAN PRESS	121.8	9.6	120.3	9.7	.27	.5	41	.2

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	150.0	6.9	12
BP DIAST	88.8	6.1	12
H. R.	77.0	10.3	13
PULSE PRESS	61.1	3.6	12
MEAN PRESS	109.3	6.2	12

TABLE A1 (continued)

SUBJECT # 70008 DATE 5/23/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	125.0	2.3	5
BP DIAST	70.6	2.3	5
H. R.	58.4	9.1	5
PULSE PRESS	54.4	1.6	5
MEAN PRESS	88.8	2.3	5

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	115.8	13.9	134.5	9.6	-16.27	5.5	8	8.5
BP DIAST	75.2	8.1	84.8	6.4	-8.40	3.7	8	5.1
H. R.	80.3	13.1	74.3	13.7	5.19	7.9	8	.4
PULSE PRESS	40.6	6.9	49.6	4.9	-7.86	2.8	8	7.5
MEAN PRESS	88.7	10.0	101.6	7.3	-11.18	4.2	8	6.9

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	122.9	6.2	13
BP DIAST	71.4	7.1	13
H. R.	54.2	4.6	13
PULSE PRESS	51.4	2.7	13
MEAN PRESS	88.6	6.7	13

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	122.8	18.8	150.6	5.4	-23.66	2.3	10	101.1
BP DIAST	79.1	15.3	99.1	8.7	-16.99	3.8	10	19.9
H. R.	92.6	17.1	70.7	10.2	18.59	4.4	10	17.4
PULSE PRESS	43.7	7.7	51.5	6.1	-6.67	2.6	10	6.2
MEAN PRESS	93.7	16.2	116.3	7.2	-19.22	3.1	10	37.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	120.4	9.0	11
BP DIAST	69.0	8.4	11
H. R.	56.0	8.3	11
PULSE PRESS	51.3	6.2	11
MEAN PRESS	86.1	8.2	11

TABLE A-1 (continued)

SUBJECT # 70009 DATE 5/23/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	113.5	1.7	4
BP DIAST	78.5	1.7	4
H. R.	85.6	4.5	12
PULSE PRESS	35.0	.0	4
MEAN PRESS	90.5	1.7	4

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	132.2	14.5	102.3	8.6	6.05	1.8	6	10.3
BP DIAST	104.0	10.8	82.5	6.8	4.36	1.5	6	8.4
H. R.	119.8	5.5	109.5	2.5	2.10	.3	8	27.8
PULSE PRESS	28.1	5.1	19.8	4.2	1.69	.9	6	3.3
MEAN PRESS	113.5	12.1	89.1	7.4	4.96	1.6	6	9.3

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	122.8	1.6	5
BP DIAST	86.0	3.1	5
H. R.	95.4	19.8	5
PULSE PRESS	36.8	2.9	5
MEAN PRESS	98.2	2.5	5

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	120.8	11.6	125.9	11.8	-.44	.6	19	.5
BP DIAST	96.1	8.5	97.6	8.8	-.12	.4	19	.0
H. R.	134.0	3.1	130.5	3.2	.48	.5	7	.8
PULSE PRESS	24.6	5.1	28.3	5.0	-.31	.2	19	1.4
MEAN PRESS	104.3	9.4	107.2	9.6	-.24	.5	19	.2

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	128.3	3.5	6
BP DIAST	89.5	2.5	6
H. R.	95.1	8.0	7
PULSE PRESS	38.8	3.8	6
MEAN PRESS	102.3	2.2	6

TABLE A1 (continued)

SUBJECT # 70010 DATE 5/23/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	154.6	20.5	6
BP DIAST	74.1	8.7	6
PULSE PRESS	80.5	15.2	6
MEAN PRESS	101.0	11.8	6

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	176.1	17.2	175.8	17.6	.06	1.4	21	.0
BP DIAST	102.1	14.4	94.1	13.9	1.73	1.1	22	2.2
H. R.	99.3	9.5	80.1	8.3	2.77	1.5	9	3.4
PULSE PRESS	75.2	8.5	80.5	8.1	-1.18	.6	21	2.9
MEAN PRESS	125.9	14.2	122.1	14.4	.83	1.2	21	.4

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	162.2	13.3	4
BP DIAST	89.5	13.1	4
H. R.	87.2	5.3	4
PULSE PRESS	72.7	3.0	4
MEAN PRESS	113.7	13.4	4

TABLE A1 (continued)

SUBJECT # 70011 DATE 7/22/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	139.0	3.1	9
BP DIAST	68.7	2.3	9
H. R.	54.6	2.4	28
PULSE PRESS	70.2	1.4	9
MEAN PRESS	92.1	2.5	9

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	154.4	6.6	152.1	6.5	.33	.2	56	2.3
BP DIAST	84.8	4.7	84.3	4.8	.07	.1	56	.2
H. R.	62.5	3.2	61.4	3.2	.14	.1	56	1.8
PULSE PRESS	69.6	4.7	67.8	4.6	.25	.1	56	2.7
MEAN PRESS	107.9	5.0	106.8	5.0	.16	.1	56	1.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	143.6	6.6	13
BP DIAST	66.0	4.9	13
H. R.	53.8	3.1	13
PULSE PRESS	77.6	3.2	13
MEAN PRESS	91.8	5.4	13

TABLE A1 (continued)

SUBJECT # 70012 DATE 7/22

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	125.1	4.4	22
BP DIAST	75.1	4.9	22
H. R.	71.2	4.4	26
PULSE PRESS	50.0	2.6	22
MEAN PRESS	91.8	4.4	22

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	145.1	8.2	148.1	8.1	-.44	.2	44	2.3
BP DIAST	99.8	7.1	97.3	6.9	.38	.2	44	2.3
H. R.	98.1	6.1	96.4	6.1	.22	.1	64	1.7
PULSE PRESS	45.2	5.3	50.8	4.1	-.82	.1	44	31.5
MEAN PRESS	114.9	7.1	114.2	7.2	.11	.2	44	.1

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	130.7	5.0	7
BP DIAST	78.0	3.6	7
H. R.	71.2	7.4	13
PULSE PRESS	52.7	2.8	7
MEAN PRESS	95.5	3.8	7

TABLE A1 (continued)

SUBJECT # 70013 DATE 7/22/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	134.7	3.1	10
BP DIAST	80.4	2.3	10
H. R.	53.2	3.0	18
PULSE PRESS	54.3	2.7	10
MEAN PRESS	98.4	2.4	10

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	150.4	10.5	145.7	10.3	.99	.6	34	2.2
BP DIAST	100.9	6.3	96.2	5.8	.99	.3	34	6.9
H. R.	82.9	10.3	80.9	10.4	.25	.3	62	.7
PULSE PRESS	49.4	6.1	49.4	6.2	.00	.4	34	.0
MEAN PRESS	117.4	7.5	112.7	7.1	1.00	.4	34	4.7

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	135.4	2.0	10
BP DIAST	77.6	4.5	10
H. R.	57.0	9.3	14
PULSE PRESS	57.8	3.9	10
MEAN PRESS	96.8	3.4	10

TABLE A1 (continued)

SUBJECT # 70014 DATE 7/22/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	102.8	4.0	8
BP DIAST	62.3	3.1	8
H. R.	65.4	3.3	16
PULSE PRESS	40.5	3.0	8
MEAN PRESS	75.8	3.2	8

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	126.6	7.2	129.7	7.0	-.43	.2	45	3.7
BP DIAST	87.5	4.7	84.1	4.1	.49	.1	45	13.7
H. R.	76.7	4.8	73.4	4.4	.42	.1	64	11.2
PULSE PRESS	39.0	6.9	45.6	5.5	-.92	.1	45	27.3
MEAN PRESS	100.6	4.5	99.2	4.5	.19	.1	45	1.7

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	113.0	5.6	11
BP DIAST	70.4	2.2	11
H. R.	59.1	2.8	13
PULSE PRESS	42.5	5.8	11
MEAN PRESS	84.6	2.5	11

TABLE A1 (continued)

SUBJECT # 70016 DATE 7/22/63

H. R.	52.5			2.8			14	

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	132.5	6.9	132.7	7.0	-.03	.3	29	.0
BP DIAST	100.8	8.4	95.1	7.9	.76	.3	27	3.9
H. R.	70.3	5.9	67.1	5.7	.43	.1	60	5.9
PULSE PRESS	31.9	11.8	36.8	11.7	-.66	.5	27	1.3
MEAN PRESS	111.6	5.6	107.5	5.3	.54	.2	27	4.3
H. R.	60.3			9.4			15	

TABLE A1 (continued)

SUBJECT # 70017 DATE 7/22/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	129.6	4.2	6
BP DIAST	69.5	4.2	6
H. R.	70.8	3.0	18
PULSE PRESS	60.1	7.9	6
MEAN PRESS	89.6	1.7	6

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	155.9	6.5	154.3	6.5	.21	.2	51	.8
BP DIAST	96.9	5.0	96.2	5.1	.10	.1	51	.3
H. R.	93.8	6.5	86.1	4.9	1.03	.1	60	44.9
PULSE PRESS	58.9	3.6	58.1	3.6	.10	.1	51	.7
MEAN PRESS	116.6	5.3	115.7	5.3	.13	.1	51	.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	140.2	5.4	10
BP DIAST	76.6	3.8	10
H. R.	74.0	3.6	13
PULSE PRESS	63.6	3.2	10
MEAN PRESS	97.8	4.1	10

TABLE A-1 (continued)

SUBJECT # 70011 DATE 8/ 5/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	145.8	4.8	16
BP DIAST	69.9	3.4	16
H. R.	62.7	2.6	18
PULSE PRESS	75.9	2.5	16
MEAN PRESS	95.2	3.7	16

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	152.1	19.6	170.1	16.8	-2.73	.6	55	19.9
BP DIAST	84.5	6.0	88.4	5.6	-.59	.2	55	8.2
H. R.	86.5	12.1	77.3	11.0	1.35	.3	56	12.0
PULSE PRESS	67.5	15.1	81.6	12.9	-2.13	.4	55	20.8
MEAN PRESS	107.0	10.1	115.7	8.9	-1.30	.3	55	16.1

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	156.3	3.6	13
BP DIAST	77.7	4.3	13
H. R.	58.1	5.6	13
PULSE PRESS	78.6	2.8	13
MEAN PRESS	104.0	3.9	13

TABLE A1 (continued)

SUBJECT # 70012 DATE 8/ 5/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	124.4	4.5	45
BP DIAST	74.2	3.2	45
H. R.	98.4	7.3	52
PULSE PRESS	50.2	2.9	45
MEAN PRESS	91.0	3.4	45

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	142.7	9.6	147.7	9.3	-.70	.2	60	5.9
BP DIAST	95.8	6.8	97.3	6.8	-.19	.2	60	.8
H. R.	129.3	4.0	128.1	4.1	.31	.3	6	.8
PULSE PRESS	46.8	4.4	50.4	3.8	-.50	.1	60	17.7
MEAN PRESS	111.4	7.6	114.1	7.5	-.37	.2	60	2.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	144.8	6.4	13
BP DIAST	88.9	4.9	13
H. R.	107.1	11.4	13
PULSE PRESS	55.9	4.4	13
MEAN PRESS	107.5	5.1	13

TABLE A1 (continued)

SUBJECT # 70013 DATE 8/ 5/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	129.1	2.4	11
BP DIAST	72.3	2.1	11
H. R.	62.7	2.4	14
PULSE PRESS	56.8	2.5	11
MEAN PRESS	91.2	2.0	11

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	117.3	19.0	142.5	11.9	-7.81	1.1	28	42.4
BP DIAST	77.2	8.4	86.3	6.6	-3.03	.7	26	16.5
H. R.	87.5	10.8	91.4	10.8	-1.22	1.0	28	1.2
PULSE PRESS	43.6	7.3	52.6	5.1	-3.01	.5	26	26.5
MEAN PRESS	91.7	10.3	103.7	7.6	-4.02	.8	26	21.7

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	122.2	21.2	14
BP DIAST	75.8	6.5	12
H. R.	52.8	2.3	14
PULSE PRESS	54.4	2.5	12
MEAN PRESS	94.0	6.5	12

TABLE A1 (continued)

SUBJECT # 70014 DATE 8/ 5/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	129.6	1.8	10
BP DIAST	76.2	1.8	10
H. R.	70.4	4.7	9
PULSE PRESS	53.4	2.0	10
MEAN PRESS	93.9	1.6	10

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	141.0	8.0	150.0	5.9	-2.10	.3	38	31.0
BP DIAST	88.6	5.0	92.1	4.6	-.82	.2	38	7.7
H. R.	90.8	6.5	89.1	6.5	.35	.3	41	.9
PULSE PRESS	52.3	4.5	57.8	3.1	-1.27	.2	38	40.1
MEAN PRESS	106.0	5.7	111.3	4.9	-1.22	.3	38	15.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	93.3	22.3	12
BP DIAST	56.8	10.0	10
H. R.	52.1	2.6	13
PULSE PRESS	43.8	6.1	10
MEAN PRESS	71.3	12.1	10

TABLE A1 (continued)

SUBJECT # 70016 DATE 8/ 5/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	130.5	5.7	11
BP DIAST	72.7	5.4	11
H. R.	74.1	4.1	14
PULSE PRESS	57.8	3.2	11
MEAN PRESS	91.9	5.1	11

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	131.2	18.6	158.6	9.5	-19.24	3.4	12	31.9
BP DIAST	84.6	9.1	95.9	6.4	-8.56	2.5	11	11.0
H. R.	86.8	13.4	98.8	11.9	-8.43	4.2	12	3.8
PULSE PRESS	50.3	6.2	59.2	3.3	-6.75	1.3	11	24.7
MEAN PRESS	101.4	10.5	115.8	6.4	-10.89	2.5	11	18.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	112.5	22.9	15
BP DIAST	64.3	8.2	13
H. R.	55.4	5.7	15
PULSE PRESS	55.3	6.7	13
MEAN PRESS	82.7	10.0	13

TABLE A1 (continued)

SUBJECT # 70017 DATE 8/ 5/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	156.5	5.3	20
BP DIAST	82.7	4.3	20
H. R.	106.6	7.6	26
PULSE PRESS	73.8	3.9	20
MEAN PRESS	107.3	4.4	20

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	146.1	12.8	158.4	10.7	-2.22	.5	45	19.1
BP DIAST	91.3	6.8	93.0	6.8	-.30	.3	45	.8
H. R.	126.6	5.4	126.7	5.5	-.02	.2	40	.0
PULSE PRESS	54.8	8.0	65.4	5.2	-1.91	.2	45	59.7
MEAN PRESS	109.6	8.4	114.9	7.9	-.95	.3	45	6.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	137.4	7.4	14
BP DIAST	80.7	3.5	14
H. R.	105.0	12.2	14
PULSE PRESS	56.7	5.5	14
MEAN PRESS	99.6	4.4	14

TABLE A1 (continued)

SUBJECT # 70011 DATE 8/19/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	137.8	6.4	15
BP DIAST	64.7	6.5	15
H. R.	61.3	2.6	37
PULSE PRESS	73.0	2.2	15
MEAN PRESS	89.0	6.3	15

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	157.7	11.6	159.2	11.6	-.21	.3	57	.3
BP DIAST	82.3	5.3	82.5	5.3	-.03	.1	57	.0
H. R.	71.9	5.2	68.3	4.8	.47	.1	60	12.0
PULSE PRESS	75.4	7.7	76.6	7.7	-.17	.2	57	.5
MEAN PRESS	107.4	7.1	108.1	7.1	-.09	.2	57	.1

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	144.2	15.3	7
BP DIAST	60.6	7.3	8
H. R.	59.2	7.1	13
PULSE PRESS	82.7	9.6	7
MEAN PRESS	89.2	9.5	7

TABLE A1 (continued)

SUBJECT # 70013 DATE 8/19/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	140.1	2.0	11
BP DIAST	73.4	2.2	11
H. R.	60.7	3.8	12
PULSE PRESS	66.7	2.2	11
MEAN PRESS	95.6	1.8	11

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	161.1	11.9	167.9	11.2	-.95	.3	55	7.6
BP DIAST	97.2	9.7	99.0	9.7	-.25	.3	55	.7
H. R.	92.0	7.9	87.2	7.4	.63	.2	58	8.7
PULSE PRESS	63.9	5.8	68.8	4.9	-.69	.1	55	20.7
MEAN PRESS	118.5	10.1	122.0	10.0	-.49	.3	55	2.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	146.5	5.3	12
BP DIAST	73.6	7.8	12
H. R.	65.0	13.4	13
PULSE PRESS	72.9	6.8	12
MEAN PRESS	98.0	6.2	12

TABLE A1 (continued)

SUBJECT # 70014 DATE 8/19/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	127.6	2.8	15
BP DIAST	64.2	2.8	15
H. R.	68.0	3.9	17
PULSE PRESS	63.3	1.9	15
MEAN PRESS	85.4	2.7	15

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	141.9	7.3	148.5	5.8	-.99	.2	41	22.9
BP DIAST	84.2	5.8	87.8	5.3	-.54	.1	41	8.3
H. R.	92.3	6.5	89.8	6.4	.31	.2	56	2.3
PULSE PRESS	57.7	4.6	60.6	4.2	-.44	.1	41	8.7
MEAN PRESS	103.4	6.0	108.0	5.2	-.70	.1	41	14.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	126.2	8.6	10
BP DIAST	63.6	3.0	10
H. R.	67.6	11.2	13
PULSE PRESS	62.6	6.6	10
MEAN PRESS	84.4	4.5	10

TABLE A1 (continued)

SUBJECT # 70016 DATE 8/19/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	125.0	5.6	5
BP DIAST	68.8	3.1	5
H. R.	68.3	4.1	28
PULSE PRESS	56.2	3.5	5
MEAN PRESS	87.6	3.7	5

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	137.8	3.9	136.7	3.8	.15	.1	54	1.8
BP DIAST	93.3	3.7	91.2	3.4	.28	.1	54	7.8
H. R.	84.0	5.6	84.4	5.6	-.04	.1	69	.1
PULSE PRESS	44.4	3.0	45.4	3.0	-.13	.0	54	2.2
MEAN PRESS	108.1	3.5	106.5	3.3	.22	.0	54	5.3

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	132.6	5.1	10
BP DIAST	74.6	5.0	10
H. R.	67.6	12.1	13
PULSE PRESS	58.0	5.9	10
MEAN PRESS	93.8	4.1	10

TABLE A1 (continued)

SUBJECT # 70017 DATE 8/19/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	127.6	5.2	9
BP DIAST	64.4	4.7	9
H. R.	77.4	4.4	12
PULSE PRESS	63.2	4.4	9
MEAN PRESS	85.5	4.3	9

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	140.6	8.3	142.6	8.2	-.26	.2	61	1.2
BP DIAST	82.2	6.3	80.1	6.2	.27	.1	61	2.3
H. R.	99.9	7.5	105.3	6.8	-.72	.1	60	13.1
PULSE PRESS	58.3	4.3	62.4	3.6	-.53	.1	61	26.5
MEAN PRESS	101.7	6.7	101.0	6.7	.09	.1	61	.2

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	130.9	2.9	12
BP DIAST	65.8	3.6	12
H. R.	82.2	7.4	13
PULSE PRESS	65.0	2.7	12
MEAN PRESS	87.5	3.1	12

TABLE A1 (*continued*)

SUBJECT # 70018 DATE 8/19/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	123.8	6.1	6
BP DIAST	70.5	5.5	6
H. R.	73.4	7.8	15
PULSE PRESS	53.3	2.5	6
MEAN PRESS	88.1	5.6	6

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	119.7	8.2	133.2	4.5	-1.69	.1	53	116.6
BP DIAST	78.8	6.0	87.6	4.0	-1.10	.1	53	63.4
H. R.	95.1	7.5	86.0	5.4	1.24	.1	59	52.4
PULSE PRESS	40.9	3.8	45.6	3.0	-.59	.1	53	31.6
MEAN PRESS	92.5	6.6	102.8	4.0	-1.30	.1	53	88.2

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	126.6	9.0	13
BP DIAST	68.4	3.6	13
H. R.	63.0	18.2	14
PULSE PRESS	58.1	6.6	13
MEAN PRESS	87.6	5.1	13

TABLE A1 (continued)

SUBJECT # 70011 DATE 9/ 2/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	151.6	4.5	16
BP DIAST	71.6	3.3	16
H. R.	58.4	3.5	18
PULSE PRESS	80.0	2.7	16
MEAN PRESS	98.2	3.5	16

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	156.4	16.5	163.6	16.1	-.66	.3	66	4.5
BP DIAST	85.3	6.9	84.2	6.9	.09	.1	65	.4
H. R.	79.3	7.4	74.8	7.0	.40	.1	72	9.9
PULSE PRESS	71.5	11.4	80.8	10.1	-.86	.2	65	18.2
MEAN PRESS	109.1	9.6	111.3	9.5	-.19	.1	65	1.1

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	153.2	3.9	8
BP DIAST	72.5	1.5	8
H. R.	59.0	6.0	9
PULSE PRESS	80.7	3.6	8
MEAN PRESS	99.2	1.9	8

TABLE A1 (continued)

SUBJECT # 70013 DATE 9/ 2/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	139.6	2.1	9
BP DIAST	78.5	2.1	9
H. R.	76.7	6.1	16
PULSE PRESS	61.1	2.9	9
MEAN PRESS	98.8	1.6	9

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	140.8	16.1	155.3	13.9	-1.88	.4	56	19.8
BP DIAST	90.0	8.7	92.5	8.6	-.32	.2	56	1.5
H. R.	111.5	10.3	100.3	8.1	1.38	.2	62	37.8
PULSE PRESS	50.8	9.2	62.8	6.1	-1.55	.1	56	69.1
MEAN PRESS	106.9	10.9	113.5	10.3	-.85	.3	56	7.4

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	140.1	13.7	13
BP DIAST	85.2	6.0	13
H. R.	89.2	14.0	13
PULSE PRESS	54.9	8.3	13
MEAN PRESS	103.6	8.4	13

TABLE A1 (continued)

SUBJECT # 70014 DATE 9/ 2/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	138.6	2.2	8
BP DIAST	73.5	2.5	8
H. R.	62.7	2.2	16
PULSE PRESS	65.1	2.0	8
MEAN PRESS	95.2	2.1	8

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	152.0	7.4	153.8	7.4	-.20	.1	59	1.0
BP DIAST	93.7	5.8	90.7	5.6	.36	.1	59	5.5
H. R.	95.4	11.8	80.0	7.9	1.75	.1	62	77.7
PULSE PRESS	58.3	4.9	63.0	4.1	-.57	.1	59	25.4
MEAN PRESS	113.1	6.0	111.8	6.0	.16	.1	59	.9

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	141.6	4.4	11
BP DIAST	75.2	2.2	11
H. R.	71.1	15.0	11
PULSE PRESS	66.3	3.2	11
MEAN PRESS	97.4	2.8	11

TABLE A1 (continued)

SUBJECT # 70016 DATE 9/ 2/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	132.1	4.6	26
BP DIAST	77.0	2.8	26
H. R.	63.4	9.4	54
PULSE PRESS	55.1	5.6	26
MEAN PRESS	95.4	2.4	26

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	133.2	16.4	154.5	9.9	-5.19	.7	32	54.3
BP DIAST	87.4	8.0	98.1	4.6	-2.79	.3	30	59.9
H. R.	93.0	13.2	84.8	12.5	1.93	.8	34	4.9
PULSE PRESS	49.2	5.8	52.2	5.6	-.79	.4	30	3.2
MEAN PRESS	103.8	8.2	115.5	3.8	-3.06	.3	30	101.7

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	124.0	19.3	13
BP DIAST	63.4	10.4	13
H. R.	58.6	12.8	13
PULSE PRESS	60.5	9.9	13
MEAN PRESS	83.6	13.0	13

TABLE A1 (continued)

SUBJECT # 70017 DATE 9/ 2/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	150.4	3.7	12
BP DIAST	76.2	3.0	12
H. R.	83.5	5.0	12
PULSE PRESS	74.1	3.6	12
MEAN PRESS	101.0	2.7	12

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	141.2	15.7	166.0	7.3	-5.06	.4	36	125.5
BP DIAST	83.7	8.0	95.1	4.9	-2.31	.3	36	57.8
H. R.	113.5	10.1	102.7	8.3	2.19	.5	36	18.5
PULSE PRESS	57.4	8.6	70.9	4.3	-2.74	.2	36	106.8
MEAN PRESS	102.9	10.4	118.8	5.5	-3.25	.3	36	91.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	128.4	31.2	13
BP DIAST	80.5	8.5	11
H. R.	94.2	12.2	13
PULSE PRESS	59.5	6.6	11
MEAN PRESS	100.4	10.3	11

TABLE A1 (concluded)

SUBJECT # 70018 DATE 9/ 2/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV	N
BP SYST	147.4	4.1	11
BP DIAST	74.9	4.1	11
H. R.	74.8	10.0	18
PULSE PRESS	72.5	2.4	11
MEAN PRESS	99.0	3.8	11

RESULTS DURING TILT

	MEAN	ST DEV	INTERCEPT	ST DEV	SLOPE	ST DEV	N	F
BP SYST	134.3	11.6	147.4	8.7	-1.62	.2	60	45.5
BP DIAST	83.5	6.5	85.1	6.5	-.20	.1	60	1.3
H. R.	108.5	12.5	121.3	10.1	-1.53	.2	64	33.8
PULSE PRESS	50.8	8.0	62.3	4.4	-1.41	.1	60	135.7
MEAN PRESS	100.4	7.7	105.9	7.1	-.68	.1	60	12.2

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV	N
BP SYST	139.3	9.1	13
BP DIAST	75.6	7.2	13
H. R.	66.0	11.4	13
PULSE PRESS	63.6	4.9	13
MEAN PRESS	96.9	7.6	13

TABLE A2

AVERAGE VALUES OF CIRCULATORY DYNAMICS

RESULTS FOR THE GROUP OF SIX SUBJECTS DATE 5/ 6/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV
BP SYST	126.70	4.6
BP DIAST	75.73	6.1
H. R.	81.46	8.3
PULSE PRESS	50.96	5.8
MEAN PRESS	92.79	5.0

RESULTS DURING TILT

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-2.79	9.4	146.9	15.8
BP DIAST	-1.41	6.5	95.6	11.9
H. R.	1.79	1.6	91.5	6.9
PULSE PRESS	-1.37	3.4	51.2	6.6
MEAN PRESS	-1.84	7.3	112.7	12.8

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	136.78	11.8
BP DIAST	83.39	7.3
H. R.	78.26	13.2
PULSE PRESS	55.57	4.4
MEAN PRESS	99.66	11.4

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-2.12	4.5	160.9	26.3
BP DIAST	-.74	2.9	102.6	13.5
H. R.	.18	1.4	93.7	5.6
PULSE PRESS	-1.37	2.0	58.3	13.1
MEAN PRESS	-1.25	3.4	122.2	17.7

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	136.90	12.4
BP DIAST	82.57	9.4
H. R.	76.01	10.2
PULSE PRESS	54.32	5.6
MEAN PRESS	100.59	10.2

TABLE A2 (continued)

RESULTS FOR THE GROUP OF SIX SUBJECTS DATE 5/ 9/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV
BP SYST	135.02	5.9
BP DIAST	81.46	5.0
H. R.	80.41	13.5
PULSE PRESS	53.55	2.7
MEAN PRESS	99.25	5.1

RESULTS DURING TILT

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-5.15	10.9	144.9	6.0
BP DIAST	-3.38	8.1	98.7	2.8
H. R.	1.67	.7	99.7	9.9
PULSE PRESS	-1.59	2.4	46.0	4.0
MEAN PRESS	-3.94	8.9	114.1	3.6

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	134.69	13.5
BP DIAST	81.94	10.1
H. R.	80.78	14.5
PULSE PRESS	52.75	5.1
MEAN PRESS	99.62	11.2

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-6.83	9.3	153.7	26.9
BP DIAST	-.20	2.0	97.6	9.2
H. R.	7.00	9.8	88.2	23.2
PULSE PRESS	-6.62	9.9	56.1	20.9
MEAN PRESS	-2.40	3.1	116.4	14.1

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	133.61	13.4
BP DIAST	83.06	11.5
H. R.	84.27	10.0
PULSE PRESS	50.54	3.2
MEAN PRESS	99.88	12.0

TABLE A2 (continued)

RESULTS FOR THE GROUP OF SIX SUBJECTS DATE 5/20/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV
BP SYST	138.83	13.3
BP DIAST	80.50	8.7
H. R.	70.08	9.3
PULSE PRESS	58.33	9.0
MEAN PRESS	99.91	9.4

RESULTS DURING TILT

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	3.96	2.5	144.8	14.8
BP DIAST	2.60	2.4	94.6	11.5
H. R.	1.43	2.1	84.0	8.0
PULSE PRESS	1.35	1.5	50.1	5.4
MEAN PRESS	3.07	2.4	111.4	12.3

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	140.98	16.1
BP DIAST	82.01	8.8
H. R.	70.88	10.2
PULSE PRESS	58.96	9.8
MEAN PRESS	101.64	10.8

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-.69	.7	161.8	12.5
BP DIAST	.07	.8	103.2	11.2
H. R.	1.04	.6	81.4	7.7
PULSE PRESS	-.83	.7	59.0	8.4
MEAN PRESS	-.13	.7	122.4	10.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	143.96	12.8
BP DIAST	83.89	10.0
H. R.	71.12	10.6
PULSE PRESS	60.07	5.1
MEAN PRESS	103.86	10.7

TABLE A2 (continued)

RESULTS FOR THE GROUP OF SIX SUBJECTS DATE 5/23/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV
BP SYST	132.14	14.3
BP DIAST	78.88	6.1
H. R.	71.42	11.7
PULSE PRESS	53.26	15.0
MEAN PRESS	96.73	6.6

RESULTS DURING TILT

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-1.32	7.6	139.7	24.7
BP DIAST	.27	4.5	92.0	7.7
H. R.	2.81	2.0	89.6	13.7
PULSE PRESS	-1.51	3.3	47.5	19.7
MEAN PRESS	-.33	5.6	108.0	12.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	140.50	16.5
BP DIAST	85.48	8.3
H. R.	75.63	14.5
PULSE PRESS	55.02	11.8
MEAN PRESS	103.83	10.3

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-4.84	10.5	145.2	16.1
BP DIAST	-3.12	7.7	102.9	8.9
H. R.	4.57	7.8	99.0	21.5
PULSE PRESS	-1.72	2.7	42.2	9.4
MEAN PRESS	-3.69	8.6	117.0	10.9

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	139.87	20.1
BP DIAST	87.43	13.2
H. R.	73.43	14.3
PULSE PRESS	52.44	10.4
MEAN PRESS	104.89	15.1

TABLE A2 (continued)

RESULTS FOR THE GROUP OF FIVE SUBJECTS DATE 5/ 6/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV
BP SYST	127.45	4.9
BP DIAST	77.98	4.1
H. R.	84.48	5.5
PULSE PRESS	49.46	5.5
MEAN PRESS	94.60	3.5

RESULTS DURING TILT

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	.92	2.5	143.5	15.0
BP DIAST	1.03	2.9	94.6	13.0
H. R.	1.86	1.8	93.0	6.5
PULSE PRESS	-.10	1.5	48.8	3.3
MEAN PRESS	1.00	2.6	110.9	13.4

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	139.79	10.3
BP DIAST	85.19	6.6
H. R.	82.17	10.2
PULSE PRESS	54.59	4.1
MEAN PRESS	103.35	7.9

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-.49	2.4	152.4	18.2
BP DIAST	.31	1.5	98.4	9.9
H. R.	-.08	1.4	95.0	5.1
PULSE PRESS	-.80	1.6	54.0	8.8
MEAN PRESS	.00	1.7	116.6	12.4

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	139.78	11.4
BP DIAST	85.84	5.6
H. R.	78.85	8.4
PULSE PRESS	53.93	6.1
MEAN PRESS	103.76	7.5

TABLE A2 (continued)

RESULTS FOR THE GROUP OF FIVE SUBJECTS DATE 5/ 9/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV
BP SYST	136.20	5.7
BP DIAST	82.53	4.8
H. R.	84.60	9.9
PULSE PRESS	53.66	3.0
MEAN PRESS	100.32	4.9

RESULTS DURING TILT

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-.68	.9	144.0	6.2
BP DIAST	-.07	.5	99.0	3.0
H. R.	1.45	.6	101.8	9.6
PULSE PRESS	-.60	.3	44.9	3.4
MEAN PRESS	-.30	.6	114.0	4.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	138.33	11.4
BP DIAST	85.37	6.4
H. R.	84.69	12.1
PULSE PRESS	52.96	5.7
MEAN PRESS	103.15	8.1

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-6.92	10.4	157.0	28.7
BP DIAST	.40	1.6	99.0	9.6
H. R.	8.09	10.6	86.9	25.7
PULSE PRESS	-7.32	10.9	58.0	22.8
MEAN PRESS	-2.04	3.4	118.4	14.8

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	137.54	10.5
BP DIAST	86.63	8.4
H. R.	87.37	7.2
PULSE PRESS	50.90	3.5
MEAN PRESS	103.56	8.9

TABLE A2 (continued)

RESULTS FOR THE GROUP OF FIVE SUBJECTS DATE 5/20/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV
BP SYST	140.40	14.3
BP DIAST	83.40	5.7
H. R.	69.64	10.3
PULSE PRESS	57.00	9.4
MEAN PRESS	102.30	8.3

RESULTS DURING TILT

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	4.28	2.6	145.6	16.4
BP DIAST	2.60	2.7	96.6	11.7
H. R.	1.54	2.3	83.7	8.9
PULSE PRESS	1.68	1.4	48.9	5.1
MEAN PRESS	3.18	2.6	112.9	13.1

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	142.57	17.4
BP DIAST	84.39	7.3
H. R.	72.54	10.5
PULSE PRESS	58.18	10.7
MEAN PRESS	103.74	10.6

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-.54	.7	162.1	13.9
BP DIAST	-.03	.8	105.4	10.9
H. R.	.95	.6	82.7	7.9
PULSE PRESS	-.57	.5	57.2	7.9
MEAN PRESS	-.15	.7	123.9	11.0

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	146.96	11.8
BP DIAST	87.07	7.1
H. R.	74.08	8.7
PULSE PRESS	59.88	5.7
MEAN PRESS	106.98	8.5

TABLE A2 (continued)

RESULTS FOR THE GROUP OF FIVE SUBJECTS DATE 5/23/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV
BP SYST	133.57	15.5
BP DIAST	80.54	5.2
H. R.	74.68	10.5
PULSE PRESS	53.03	16.8
MEAN PRESS	98.32	5.9

RESULTS DURING TILT

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	1.66	2.6	140.8	27.5
BP DIAST	2.01	1.9	93.4	7.6
H. R.	2.34	1.9	92.6	12.8
PULSE PRESS	-.24	1.2	47.1	22.0
MEAN PRESS	1.83	2.1	109.3	13.5

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	144.02	15.8
BP DIAST	88.28	5.3
H. R.	79.91	11.2
PULSE PRESS	55.74	13.1
MEAN PRESS	106.88	7.9

RESULTS DURING TILT WITH PROVOCATIVE VALSALVA MANEUVER

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-.14	.3	143.8	18.2
BP DIAST	.34	.3	103.8	10.0
H. R.	1.06	.3	106.1	16.7
PULSE PRESS	-.48	.3	39.9	9.1
MEAN PRESS	.18	.2	117.2	12.6

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	144.73	19.6
BP DIAST	92.02	9.7
H. R.	77.77	12.2
PULSE PRESS	52.71	12.0
MEAN PRESS	109.57	12.6

TABLE A2 (continued)

RESULTS FOR THE GROUP OF SIX SUBJECTS DATE 7/22/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV
BP SYST	126.28	14.0
BP DIAST	71.23	6.8
H. R.	61.32	8.8
PULSE PRESS	55.04	11.1
MEAN PRESS	89.57	8.3

RESULTS DURING TILT

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	.10	.5	143.8	10.2
BP DIAST	.46	.3	92.2	6.2
H. R.	.42	.3	77.5	12.8
PULSE PRESS	-.34	.5	51.4	10.6
MEAN PRESS	.35	.3	109.3	6.1

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	132.60	12.0
BP DIAST	73.73	5.2
H. R.	62.61	8.1
PULSE PRESS	58.87	13.0
MEAN PRESS	93.33	5.3

TABLE A2 (continued)

RESULTS FOR THE GROUP OF SIX SUBJECTS DATE 8/ 5/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV
BP SYST	136.03	12.4
BP DIAST	74.70	4.4
H. R.	79.18	18.7
PULSE PRESS	61.33	10.8
MEAN PRESS	95.10	6.1

RESULTS DURING TILT

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-5.80	7.0	154.6	9.8
BP DIAST	-2.25	3.2	92.1	4.2
H. R.	-1.27	3.6	101.9	20.9
PULSE PRESS	-2.60	2.1	61.2	11.3
MEAN PRESS	-3.13	4.0	112.6	4.6

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	127.80	23.0
BP DIAST	74.05	11.6
H. R.	71.80	26.6
PULSE PRESS	57.46	11.4
MEAN PRESS	93.20	13.8

TABLE A2 (continued)

RESULTS FOR THE GROUP OF SIX SUBJECTS DATE 8/19/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV
BP SYST	130.34	6.8
BP DIAST	67.69	3.8
H. R.	68.20	6.5
PULSE PRESS	62.64	7.1
MEAN PRESS	88.55	3.7

RESULTS DURING TILT

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-.66	.6	148.0	13.3
BP DIAST	-.23	.5	88.0	6.6
H. R.	.31	.6	86.8	11.8
PULSE PRESS	-.43	.2	59.9	12.4
MEAN PRESS	-.37	.5	108.1	7.3

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	134.53	8.8
BP DIAST	67.79	5.5
H. R.	67.46	7.8
PULSE PRESS	66.57	9.6
MEAN PRESS	90.12	4.9

TABLE A2 (concluded)

RESULTS FOR THE GROUP OF SIX SUBJECTS DATE 9/ 2/63

RESULTS IN SUPINE POSITION BEFORE TILT

	MEAN	ST DEV
BP SYST	143.34	7.7
BP DIAST	75.31	2.5
H. R.	69.96	9.8
PULSE PRESS	68.02	9.2
MEAN PRESS	97.98	2.2

RESULTS DURING TILT

	MEAN SLOPE	ST DEV	MEAN INTERCEPT	ST DEV
BP SYST	-2.44	2.1	156.8	6.8
BP DIAST	-.86	1.3	91.0	5.4
H. R.	1.02	1.3	94.0	17.3
PULSE PRESS	-1.32	.7	65.3	9.6
MEAN PRESS	-1.31	1.4	112.8	4.3

RESULTS IN SUPINE POSITION AFTER TILT

	MEAN	ST DEV
BP SYST	137.80	10.3
BP DIAST	75.45	7.4
H. R.	73.06	15.2
PULSE PRESS	64.28	8.9
MEAN PRESS	96.89	6.8

TABLE A3

AVERAGE VALUES OF CARDIAC DYNAMICS DURING THE TILT PROCEDURE[a]

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STUDY I - PERIOD 1

DATE	SITUATION	TOTAL CYCLE N	TOTAL CYCLE MEAN	TOTAL CYCLE S.D.	SYSTOLE N	SYSTOLE MEAN	SYSTOLE S.D.	DIASTOLE N	DIASTOLE MEAN	DIASTOLE S.D.	ISOTONIC N	ISOTONIC MEAN	ISOTONIC S.D.	PULSE WAVE VEL. N	PULSE WAVE VEL. MEAN	PULSE WAVE VEL. S.D.
5/ 6/63	1	5	872.02	104.64	5	367.38	21.04	5	504.64	85.97	5	280.15	21.83	5	8.17	1.72
5/ 6/63	2	5	748.49	67.31	5	339.14	12.64	5	409.35	60.04	3	246.07	13.95	4	7.67	.85
5/ 6/63	3	6	724.96	63.87	6	341.19	24.56	6	383.77	46.47	5	251.25	34.88	5	10.16	4.74
5/ 6/63	4	6	867.23	115.11	6	365.92	35.65	6	501.30	89.40	4	278.78	29.14	4	7.62	1.27
5/ 6/63	5	6	936.56	172.80	6	372.22	38.21	6	564.34	141.13	4	285.04	22.53	4	8.05	1.63
5/ 6/63	6	6	761.42	112.52	5	331.86	23.81	5	421.38	100.58	4	226.05	19.50	4	7.97	2.24
5/ 6/63	7	6	838.45	138.11	3	343.12	31.44	3	492.17	171.74	4	259.62	68.96	4	11.07	1.39
5/ 6/63	8	6	711.70	47.29	6	336.64	25.22	6	375.05	30.01	4	232.79	17.61	4	8.61	1.57
5/ 6/63	9	6	830.32	97.87	6	357.27	28.32	6	473.05	79.56	4	263.87	24.65	4	7.98	1.19
5/ 6/63	10	6	967.96	164.39	6	380.40	30.77	6	587.55	142.75	4	284.50	25.87	3	7.07	1.72
5/ 6/63	11	6	863.96	187.38	5	364.05	37.32	5	532.20	160.81	4	263.54	40.65	4	9.53	3.03
5/ 6/63	12	6	932.74	150.51	6	375.77	34.24	6	556.96	122.97	5	290.92	22.83	4	7.35	1.58
5/ 9/63	1	5	919.15	209.36	5	364.52	36.75	5	554.62	175.49	5	266.84	34.12	5	8.51	.78
5/ 9/63	2	6	730.62	191.95	5	332.81	47.70	5	405.15	167.05	6	228.79	40.13	6	9.25	1.36
5/ 9/63	3	6	588.19	106.24	6	296.09	30.65	6	292.09	77.41	5	181.98	20.22	6	9.78	1.80
5/ 9/63	4	6	773.31	165.32	6	334.09	42.21	6	439.22	123.98	6	247.07	41.55	6	8.29	.95
5/ 9/63	5	6	909.35	185.90	6	361.97	33.90	6	547.37	155.25	6	264.85	34.78	6	8.58	.89
5/ 9/63	6	6	751.53	118.43	4	326.40	18.20	4	407.15	108.55	5	221.22	17.97	5	8.41	.86
5/ 9/63	7	6	677.30	169.98	6	283.62	33.91	6	393.67	146.06	6	206.03	35.44	6	9.36	1.37
5/ 9/63	8	6	591.73	77.91	6	305.64	25.05	6	286.08	55.59	5	202.93	28.56	6	9.20	1.44
5/ 9/63	9	6	794.66	134.77	6	338.11	31.88	6	456.55	107.77	6	247.77	26.56	6	8.69	1.28
5/ 9/63	10	6	882.91	204.69	6	357.01	35.61	6	525.89	172.50	6	265.51	37.14	6	8.20	1.02
5/ 9/63	11	6	915.92	165.09	5	332.73	43.85	5	547.83	122.17	5	263.64	24.51	5	7.41	2.03
5/ 9/63	12	6	855.19	158.27	5	348.07	26.49	5	454.29	77.45	6	260.51	29.15	6	8.61	.78

[a]All values are given in milliseconds except pulse wave velocity values are expressed in meters per second.

T A B L E A3 (continued)

AVERAGE VALUES OF CARDIAC DYNAMICS
DURING THE TILT PROCEDURE[a]

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STUDY I – PERIOD 2

DATE	SITU-ATION	TOTAL CYCLE N	TOTAL CYCLE MEAN	TOTAL CYCLE S.D.	SYSTOLE N	SYSTOLE MEAN	SYSTOLE S.D.	DIASTOLE N	DIASTOLE MEAN	DIASTOLE S.D.	ISOTONIC N	ISOTONIC MEAN	ISOTONIC S.D.	PULSE WAVE VEL. N	PULSE WAVE VEL. MEAN	PULSE WAVE VEL. S.D.
5/20/63	1	6	993.23	124.32	6	389.27	30.59	6	603.96	97.40	6	294.35	25.55	6	9.49	1.31
5/20/63	2	6	794.77	86.72	6	344.92	35.47	6	449.85	56.28	6	242.21	25.65	5	9.00	1.52
5/20/63	3	6	756.53	68.92	6	339.51	28.67	6	417.01	41.22	6	232.12	20.54	6	8.38	2.63
5/20/63	4	6	894.30	108.53	6	370.82	29.87	6	523.48	84.65	6	284.42	22.67	6	8.26	1.41
5/20/63	5	6	997.81	107.88	6	385.03	30.84	6	612.77	81.43	6	291.35	27.42	6	9.30	1.22
5/20/63	6	6	868.71	79.97	5	347.29	29.17	5	510.90	59.56	6	250.03	20.01	6	9.87	1.70
5/20/63	7	6	881.68	78.93	6	324.33	28.56	6	557.34	79.85	6	240.04	16.12	6	9.44	2.39
5/20/63	8	6	714.57	79.94	6	322.17	28.82	6	392.40	52.27	6	215.62	23.85	6	10.22	1.08
5/20/63	9	6	874.21	102.03	6	360.55	28.06	6	513.66	83.08	6	271.41	28.24	6	8.44	.66
5/20/63	10	6	996.66	139.12	6	379.71	36.23	6	616.94	105.00	6	287.51	33.18	6	8.70	1.11
5/20/63	11	6	1013.05	83.52	6	367.05	23.37	6	646.00	81.18	4	289.47	25.06	6	8.91	2.62
5/20/63	12	6	1018.88	149.18	6	383.42	36.21	6	635.46	116.75	5	294.61	30.16	6	8.47	.73
5/23/63	1	5	916.67	173.36	5	370.56	26.32	5	546.11	147.26	5	270.74	28.97	5	7.99	1.34
5/23/63	2	5	713.74	108.46	5	316.45	18.74	5	397.29	90.88	5	219.36	20.35	5	8.50	1.50
5/23/63	3	5	614.46	95.00	5	301.25	27.76	5	313.20	67.77	5	205.34	27.12	4	9.26	1.53
5/23/63	4	5	808.77	178.56	5	337.21	47.47	5	471.56	137.66	5	257.28	43.05	4	8.80	2.38
5/23/63	5	5	939.65	206.99	5	360.21	22.10	5	579.44	190.92	5	270.78	35.83	5	8.42	1.62
5/23/63	6	5	705.18	117.87	5	318.71	23.47	5	386.46	96.26	5	220.91	27.50	4	7.65	.81
5/23/63	7	5	704.78	94.51	5	282.93	28.27	5	421.85	92.75	5	219.17	26.20	4	8.07	1.04
5/23/63	8	5	555.76	80.28	5	292.65	31.14	5	263.10	55.86	5	197.97	33.38	4	10.33	3.71
5/23/63	9	5	798.37	188.77	5	335.59	51.46	5	462.77	140.45	5	255.29	52.74	5	7.21	2.29
5/23/63	10	5	941.95	209.11	5	369.40	33.26	5	572.54	176.45	5	269.10	40.30	5	7.44	1.11
5/23/63	11	5	920.61	96.78	5	349.38	32.94	5	571.22	66.88	5	257.70	43.68	5	7.89	2.98
5/23/63	12	5	911.90	182.49	5	368.08	29.99	5	543.81	152.86	5	261.60	46.41	4	10.36	5.51

[a]All values are given in milliseconds except pulse wave velocity values are expressed in meters per second.

T A B L E A3 (continued)

AVERAGE VALUES OF CARDIAC DYNAMICS
DURING THE TILT PROCEDURE[a]

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STUDY II - PERIOD 1

DATE	SITU-ATION	TOTAL CYCLE N	TOTAL CYCLE MEAN	TOTAL CYCLE S.D.	SYSTOLE N	SYSTOLE MEAN	SYSTOLE S.D.	DIASTOLE N	DIASTOLE MEAN	DIASTOLE S.D.	ISOTONIC N	ISOTONIC MEAN	ISOTONIC S.D.	PULSE WAVE VEL. N	PULSE WAVE VEL. MEAN	PULSE WAVE VEL. S.D.
7/22/63	1	6	905.92	134.72	6	369.30	14.08	6	536.62	122.78	6	278.68	8.21	6	8.42	1.89
7/22/63	2	6	722.43	133.76	6	318.30	31.61	6	404.12	107.96	6	228.42	29.21	6	8.90	2.30
7/22/63	3	6	670.46	127.17	6	314.18	25.30	6	356.27	113.57	6	212.33	22.71	6	8.31	1.57
7/22/63	4	6	820.71	86.09	6	349.55	14.05	6	471.15	79.95	6	264.05	12.82	6	7.54	.88
7/22/63	5	6	967.58	142.21	6	366.74	9.58	6	600.83	135.38	6	272.91	5.83	6	7.92	1.44
8/ 5/63	1	6	812.81	176.53	6	336.71	32.92	6	476.09	146.04	6	251.80	25.02	6	8.76	1.14
8/ 5/63	2	6	633.63	147.68	6	283.46	36.46	6	350.17	116.56	6	195.67	22.84	6	8.35	.63
8/ 5/63	3	6	559.70	106.29	6	285.40	33.54	6	274.30	80.62	6	181.22	19.22	6	9.98	4.26
8/ 5/63	4	6	800.25	252.52	6	320.08	52.35	6	480.16	203.78	6	245.24	43.69	6	8.20	2.16
8/ 5/63	5	6	901.13	236.65	6	344.70	26.93	6	556.42	211.01	6	255.78	25.82	6	7.89	1.26
8/14/63	1	6	914.42	67.40	6	378.15	16.41	6	536.27	62.70	6	291.25	12.02	6	8.73	.95
8/14/63	2	6	752.69	109.59	6	336.98	20.71	6	415.70	99.92	6	233.66	15.93	6	9.66	1.01
8/14/63	3	6	715.64	114.69	6	335.05	15.25	6	380.58	111.22	6	221.65	17.16	6	9.35	.92
8/14/63	4	6	868.82	79.83	6	367.05	24.16	6	501.77	60.69	6	277.10	19.84	6	8.65	.74
8/14/63	5	6	990.65	91.28	6	382.57	18.73	6	608.08	80.48	6	291.13	15.85	6	8.51	.59

[a] All values are given in milliseconds except pulse wave velocity values are expressed in meters per second.

T A B L E A3 (concluded)

AVERAGE VALUES OF CARDIAC DYNAMICS
DURING THE TILT PROCEDURE[a]

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STUDY II - PERIOD 2

DATE	SITU-ATION	TOTAL CYCLE N	TOTAL CYCLE MEAN	TOTAL CYCLE S.D.	SYSTOLE N	SYSTOLE MEAN	SYSTOLE S.D.	DIASTOLE N	DIASTOLE MEAN	DIASTOLE S.D.	ISOTONIC N	ISOTONIC MEAN	ISOTONIC S.D.	PULSE WAVE VEL. N	PULSE WAVE VEL. MEAN	PULSE WAVE VEL. S.D.
8/19/63	1	6	887.70	97.89	6	359.71	13.94	6	527.98	85.69	6	277.35	11.36	6	7.90	1.10
8/19/63	2	6	703.72	96.28	6	317.88	19.82	6	385.83	81.86	6	219.74	11.95	6	8.24	.66
8/19/63	3	6	668.99	80.07	6	316.87	12.66	6	352.12	81.30	6	208.95	9.14	6	8.43	.88
8/19/63	4	6	877.93	119.18	6	349.07	12.80	6	528.85	110.60	6	270.12	11.18	6	6.91	1.22
8/19/63	5	6	970.09	153.02	6	363.36	18.93	6	606.73	135.38	6	280.73	16.95	6	7.69	1.52
9/ 2/63	1	6	881.12	154.49	6	350.95	20.01	6	530.17	137.87	6	260.14	23.93	6	8.98	1.28
9/ 2/63	2	6	659.34	177.75	6	300.96	36.95	6	358.38	146.14	6	207.65	39.57	6	9.65	1.87
9/ 2/63	3	6	586.21	96.18	6	296.64	14.23	6	289.57	91.59	6	187.14	20.31	6	8.71	2.18
9/ 2/63	4	6	860.68	136.03	6	332.74	22.47	6	527.93	119.82	6	247.15	26.74	6	8.82	2.06
9/ 2/63	5	6	897.37	123.32	6	351.32	7.16	6	546.04	120.95	6	258.14	19.03	6	8.37	1.93
9/ 6/63	1	5	870.73	121.19	5	357.26	32.70	5	513.47	99.66	5	275.29	18.84	5	8.48	.80
9/ 6/63	2	5	727.19	176.66	5	325.98	34.74	5	401.21	146.82	5	227.58	29.86	5	9.65	2.05
9/ 6/63	3	5	666.98	89.05	4	295.60	9.54	4	348.97	80.50	5	214.04	28.11	5	8.61	.73
9/ 6/63	4	5	811.11	96.12	5	337.06	46.29	5	474.05	59.75	5	251.80	35.88	5	8.36	.78
9/ 6/63	5	5	908.29	182.01	5	355.23	36.58	5	553.06	165.43	5	268.19	26.17	5	8.04	.38

[a]All values are given in milliseconds except pulse wave velocity values are expressed in meters per second.

TABLE A4

AVERAGE VALUES OF OBSERVED/PREDICTED RATIOS OF CARDIAC DYNAMICS DURING THE TILT PROCEDURE

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STUDY I - PERIOD 1

DATE	SITUATION	S/S* N	S/S* MEAN	S/S* S.D.	I/I* N	I/I* MEAN	I/I* S.D.	M/M* N	M/M* MEAN	M/M* S.D.	I/M N	I/M MEAN	I/M S.D.
5/ 6/63	1	5	1.010	.025	5	.968	.043	5	1.183	.229	5	3.280	.670
5/ 6/63	2	5	1.006	.034	3	.894	.013	3	1.525	.301	3	2.610	.340
5/ 6/63	3	6	1.027	.045	5	.925	.104	5	1.578	.368	5	2.780	.850
5/ 6/63	4	6	1.008	.059	4	.980	.059	4	1.264	.091	4	3.150	.170
5/ 6/63	5	6	.989	.048	4	.968	.033	4	1.203	.131	4	3.030	.260
5/ 6/63	6	5	.984	.021	4	.832	.078	3	1.587	.216	4	1.670	1.780
5/ 6/63	7	3	.974	.139	4	.900	.195	2	1.557	1.880	4	4.530	9.580
5/ 6/63	8	6	1.023	.051	4	.861	.051	4	1.863	.037	4	2.100	.100
5/ 6/63	9	6	1.006	.053	4	.936	.071	4	1.310	.250	4	3.040	.770
5/ 6/63	10	6	.995	.053	4	.960	.048	4	1.189	.089	4	2.990	.250
5/ 6/63	11	5	.993	.068	4	.924	.057	3	1.519	.613	4	1.690	1.850
5/ 6/63	12	6	1.000	.045	5	.968	.040	5	1.126	.187	5	3.150	.430
5/ 9/63	1	5	.981	.036	5	.907	.049	5	1.296	.280	5	2.720	.320
5/ 9/63	2	5	1.000	.030	6	.841	.079	5	1.696	.366	6	1.820	1.410
5/ 9/63	3	6	.992	.033	5	.733	.044	5	2.514	.436	5	1.720	.210
5/ 9/63	4	6	.977	.029	6	.888	.092	6	1.400	.363	6	2.930	.860
5/ 9/63	5	6	.978	.036	6	.902	.059	6	1.301	.301	6	2.730	.450
5/ 9/63	6	4	.981	.035	5	.815	.036	4	1.706	.326	5	1.570	1.450
5/ 9/63	7	6	.893	.079	6	.778	.079	6	1.540	.566	6	2.720	.750
5/ 9/63	8	6	1.020	.034	5	.798	.083	5	2.179	.495	5	2.090	.700
5/ 9/63	9	6	.975	.047	6	.884	.046	6	1.384	.353	6	2.810	.610
5/ 9/63	10	6	.981	.041	6	.914	.057	6	1.283	.355	6	2.940	.610
5/ 9/63	11	5	.911	.066	5	.906	.033	4	.890	.244	5	3.230	2.500
5/ 9/63	12	5	.997	.028	6	.906	.046	5	1.434	.166	6	2.000	1.480

S/S* - OBSERVED/PREDICTED SYSTOLE
I/I* - OBSERVED/PREDICTED ISOTONIC PHASE
M/M* - OBSERVED/PREDICTED ISOMETRIC PHASE
I/M - HEMODYNAMIC RATIO

T A B L E A4 (continued)

AVERAGE VALUES OF OBSERVED/PREDICTED
RATIOS OF CARDIAC DYNAMICS
DURING THE TILT PROCEDURE

****

STUDY I - PERIOD 2

CATE	SITU-ATICN	S/S* N	S/S* MEAN	S/S* S.D.	I/I* N	I/I* MEAN	I/I* S.D.	M/M* N	M/M* MEAN	M/M* S.D.	I/M N	I/M MEAN	I/M S.D.
5/20/63	1	6	1.002	.032	6	.973	.054	6	1.111	.171	6	3.170	.590
5/20/63	2	6	.991	.056	6	.863	.065	6	1.531	.201	6	2.380	.360
5/20/63	3	6	1.000	.040	6	.841	.051	6	1.694	.087	6	2.160	.160
5/20/63	4	6	1.006	.043	6	.975	.062	6	1.125	.204	6	3.430	.840
5/20/63	5	6	.988	.038	6	.960	.061	6	1.094	.169	6	3.170	.640
5/20/63	6	5	.961	.041	6	.864	.042	5	1.354	.193	6	1.950	1.470
5/20/63	7	6	.887	.083	6	.826	.049	6	1.130	.343	6	3.000	.770
5/20/63	8	6	.977	.036	6	.797	.059	6	1.815	.212	6	2.020	.220
5/20/63	9	6	.990	.053	6	.936	.066	6	1.211	.262	6	3.100	.640
5/20/63	10	6	.976	.033	6	.948	.066	6	1.087	.187	6	3.170	.620
5/20/63	11	6	.936	.062	4	.954	.057	4	.944	.227	4	3.690	.840
5/20/63	12	6	.975	.037	5	.953	.057	5	1.072	.195	5	3.100	.550
5/23/63	1	5	.998	.025	5	.920	.043	5	1.322	.332	5	2.720	.390
5/23/63	2	5	.963	.027	5	.813	.050	5	1.682	.306	5	2.270	.340
5/23/63	3	5	.987	.017	5	.800	.070	5	2.036	.507	5	2.150	.370
5/23/63	4	5	.964	.061	5	.911	.084	5	1.225	.380	5	3.450	1.400
5/23/63	5	5	.962	.064	5	.912	.052	5	1.200	.495	5	3.460	2.000
5/23/63	6	5	.976	.030	5	.820	.056	5	1.746	.421	5	2.270	.390
5/23/63	7	5	.868	.098	5	.816	.093	5	1.128	.294	5	3.510	.840
5/23/63	8	5	1.008	.055	5	.797	.102	5	2.340	.752	5	2.090	.420
5/23/63	9	5	.966	.054	5	.907	.119	5	1.279	.399	5	3.230	.930
5/23/63	10	5	.982	.023	5	.905	.065	5	1.310	.375	5	2.720	.680
5/23/63	11	5	.933	.045	5	.873	.132	5	1.163	.323	5	3.030	1.150
5/23/63	12	5	.993	.018	5	.888	.099	5	1.447	.526	5	2.560	.890

S/S* - OBSERVED/PREDICTED SYSTOLE
I/I* - OBSERVED/PREDICTED ISOTONIC PHASE
M/M* - OBSERVED/PREDICTED ISOMETRIC PHASE
I/M - HEMODYNAMIC RATIO

T A B L E A4 (continued)

AVERAGE VALUES OF OBSERVED/PREDICTED
RATIOS OF CARDIAC DYNAMICS
DURING THE TILT PROCEDURE

****

STUDY II - PERIOD 1

DATE	SITU-ATION	S/S* N	S/S* MEAN	S/S* S.D.	I/I* N	I/I* MEAN	I/I* S.D.	M/M* N	M/M* MEAN	M/M* S.D.	I/M N	I/M MEAN	I/M S.D.
7/22/63	1	6	.999	.046	6	.954	.053	6	1.172	.190	6	3.180	.770
7/22/63	2	6	.964	.048	6	.843	.075	6	1.557	.332	6	2.550	.380
7/22/63	3	6	.990	.070	6	.806	.074	6	1.934	.391	6	2.100	.320
7/22/63	4	6	.992	.046	6	.932	.036	6	1.240	.166	6	3.090	.200
7/22/63	5	6	.961	.057	6	.913	.037	6	1.144	.161	6	2.910	.170
8/ 5/63	1	6	.964	.035	6	.894	.019	6	1.295	.308	6	3.000	.380
8/ 5/63	2	6	.918	.052	6	.757	.030	6	1.826	.443	6	2.260	.270
8/ 5/63	3	6	.981	.061	6	.731	.042	6	2.521	.528	6	1.740	.110
8/ 5/63	4	6	.929	.050	6	.877	.061	6	1.243	.500	6	3.470	1.070
8/ 5/63	5	6	.945	.068	6	.879	.019	6	1.266	.462	6	2.880	.380
8/14/63	1	6	1.015	.045	6	.990	.032	6	1.113	.204	6	3.420	.590
8/14/63	2	6	.999	.061	6	.850	.034	6	1.670	.352	6	2.300	.370
8/14/63	3	6	1.022	.076	6	.821	.036	6	1.990	.553	6	1.990	.380
8/14/63	4	6	1.010	.035	6	.958	.043	6	1.215	.140	6	3.090	.290
8/14/63	5	6	.987	.037	6	.963	.033	6	1.075	.162	6	3.210	.410

S/S* - OBSERVED/PREDICTED SYSTOLE
I/I* - OBSERVED/PREDICTED ISOTONIC PHASE
M/M* - OBSERVED/PREDICTED ISOMETRIC PHASE
I/M - HEMODYNAMIC RATIO

T A B L E A4 (concluded)

AVERAGE VALUES OF OBSERVED/PREDICTED
RATIOS OF CARDIAC DYNAMICS
DURING THE TILT PROCEDURE

****

STUDY II - PERIOD 2

DATE	SITU-ATION	N	S/S* MEAN	S.D.	N	I/I* MEAN	S.D.	N	M/M* MEAN	S.D.	N	I/M MEAN	S.D.
8/19/63	1	6	.981	.027	6	.953	.026	6	1.090	.148	6	3.390	.400
8/19/63	2	6	.974	.038	6	.818	.019	6	1.711	.227	6	2.240	.170
8/19/63	3	6	.997	.065	6	.792	.031	6	2.014	.366	6	1.940	.220
8/19/63	4	6	.959	.045	6	.933	.029	6	1.067	.176	6	3.440	.410
8/19/63	5	6	.950	.034	6	.937	.025	6	1.009	.151	6	3.390	.170
9/ 2/63	1	6	.964	.052	6	.897	.030	6	1.260	.392	6	2.910	.540
9/ 2/63	2	6	.959	.064	6	.790	.078	6	1.930	.740	6	2.300	.690
9/ 2/63	3	6	1.000	.077	6	.742	.048	6	2.551	.959	6	1.740	.350
9/ 2/63	4	6	.923	.047	6	.858	.066	6	1.202	.357	6	2.970	.700
9/ 2/63	5	6	.956	.064	6	.884	.037	6	1.258	.398	6	2.850	.650
9/ 6/63	1	5	.983	.057	5	.953	.050	5	1.101	.202	5	3.520	.950
9/ 6/63	2	5	.987	.047	5	.839	.041	5	1.724	.461	5	2.370	.560
9/ 6/63	3	4	.947	.053	5	.811	.083	4	1.831	.469	5	1.560	1.480
9/ 6/63	4	5	.958	.084	5	.892	.108	5	1.223	.216	5	3.130	.980
9/ 6/63	5	5	.962	.087	5	.917	.064	5	1.153	.335	5	3.170	.640

S/S* - OBSERVED/PREDICTED SYSTOLE
I/I* - OBSERVED/PREDICTED ISOTONIC PHASE
M/M* - OBSERVED/PREDICTED ISOMETRIC PHASE
I/M - HEMODYNAMIC RATIO